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STATE OF NEW YORK

ANNUAL REPORT

OF THE

State Engineer and Surveyor

For the Year Ended June 30, 1919

ALBANY
J. B. LYON COMPANY, PRINTERS
1920

STATE OF NEW YORK

OFFICE OF THE STATE ENGINEER AND SURVEYOR

ALBANY, N. Y., *February* 16, 1920.

To the Legislature:

I beg to transmit herewith the State Engineer and Surveyor's annual report for the year 1919.

Respectfully,

FRANK M. WILLIAMS,

State Engineer and Surveyor.

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The report of the Gaging of Streams for 1919 is published as a supplemental volume, or Vol. II.

REPORT

One of the duties of the State Engineer and Surveyor is to report to the Legislature each year on the activities of his Department. I submit herewith such report. For convenience the descriptive matter covers the calendar year of 1919. The financial tables and details of construction cover the fiscal year ended June 30, 1919. The State Engineer is a member of two constitutional boards, the Canal Board and the Land Board, and two permanent statutory boards, the Board of Canvassers and the Board of Equalization of Assessments. During the past calendar year the State Engineer served as a member of the following special boards or commissions: River Regulating Section of the Conservation Commission; Hospital Development Commission, Jamaica Bay–Peconic Bay Canal Board, Interstate Bridge Commission, the New York–New Jersey Bridge and Tunnel Commission, the Harlem River Improvement Board and the Gravesend Bay–Jamaica Bay Waterways Board.

For the past few years the construction of the Barge canal and its terminals has been the most important work carried on by the Department. With this work drawing to a close, the force has been materially reduced and the Department has been reorganized with the view of performing the engineering work necessary in the proper maintenance of the new canal system and to perform for other State departments work of an engineering character.

BARGE CANAL

During the navigation season of 1919 the canal has been in full operation and, while the traffic making use of the canal did not tax it to anywhere near its capacity, it demonstrated that from the purely construction standpoint the structures operated in accordance with the plans of the designers, and the failure to make a more extended use of the canal cannot be attributed to faulty design or operation. The uncompleted work, of which practically all is under contract, consists of the construction of additional

bridges to span the channel, further protection to the banks and structures, widening the approach in the Rochester harbor and other miscellaneous work, all designed to improve navigating conditions. The new canal system was opened to navigation on May 15, 1918, and since that date has been in operation. The work herein referred to as uncompleted must not be classed as absolutely essential to the use of the canal, for such is not the case.

USE OF CANAL

In the season of 1918 boats were so scarce that the traffic was necessarily limited to the capacity of the available craft. In 1919 the number of boats navigating the canal was slightly increased. The Federal Government had built about seventy-five barges and several business corporations had their own boats. Some of the old canal boats were still in use, so that there were in operation about the equivalent of two hundred new barges.

There are some hopeful signs. Certain large companies have built and are using their own boats. Purchases of property adjacent to the canal have been made for the erection of plants or the storage of commodities. New articles have appeared on the list of canal freights.

It is not hard to discover ample reasons for this lack of sufficient traffic on the canal. The Government control, while it was expected to hasten by years the full development of canal traffic, has proved instead to be a hindrance. Although this control has not been nominally in force during 1919, nevertheless, through its regulation of traffic which might otherwise reach the canal and its ownership and operation of boats, its influence is still being felt. The lack of boats is easily explained. During the war the building of new craft by private companies was practically impossible. Although conditions have somewhat improved, still the high cost of labor and materials is holding back the building of canal barges. Moreover, the need of knowledge concerning both the canal and its advantages on the part of the shippers in general and also the lack of proper appreciation of its value account for much of the insufficient use. The process of building up traffic is necessarily slow. Traffic is peculiar in that once going in a given channel it often keeps to the same course irrespective of logic or reason.

Barge Canal Terminal, Pier 6, New York City

The freight-house has recently been completed and opened to traffic. The head-house contains the New York offices of the State Engineer and the Superintendent of Public Works.

CANAL MAINTENANCE

While the maintenance of the canal system does not come under the direct supervision of the State Engineer, it is necessary to furnish the engineering assistance required in the performance of the maintenance work. The canal has been completed and to be efficiently operated must be given proper maintenance. The equipment and force required to maintain the new canal differs greatly from that required on the old canal. The Superintendent of Public Works should be given the funds to properly equip his department to meet the problem now facing him in the maintenance of the new canal system.

FEDERAL CONNECTIONS — NOT YET MADE

The four main termini of the Barge canal system adjoin waters controlled by the Federal Government. Thus at the eastern and western extremities of the Erie branch are the Hudson and the Niagara rivers, respectively. At the northern end of the Oswego branch lies Lake Ontario. The Champlain branch terminates on the north in Lake Champlain, while its southern terminus is identical with the eastern terminus of the Erie branch.

The Government has improved the Niagara river to meet Barge canal requirements. At Oswego there was a stretch between the canal terminus and the lake harbor which the United States should have deepened, but which it entirely neglected. After waiting for some time for Congress to authorize this work, the State was obligated to open the channel, in order that the canal might not terminate in a dead end. Further harbor improvement at Oswego may with propriety be undertaken by the Federal authorities. During the past year Government dredging operations have been in progress in Lake Champlain — largely in straightening the tortuous channel at the southern end.

The Federal Government has provided an outlet in the Hudson of a size equal to the Barge canal, but for several years strenuous efforts have been made to induce Congress to deepen the channel north of the city of Hudson. This would allow canal barges to trans-ship their cargoes without making the 300-mile trip down the river and back. Also, it would help solve the difficult problem of a congested port at New York. The success attending some-

what similar undertakings in Europe argues in favor of this Hudson river deepening.

The State has spent a vast sum to improve its canals and it is only just that the United States should do its share and contribute at least a comparatively small amount to enable the State to reap its full measure of success. I can but renew my recommendation that your body take appropriate action to set the facts before Congress and ask its coöperation.

USE OF SURPLUS WATERS

The subject of conserving our natural resources, especially the water-power of our streams, has for several years been the theme of many a public utterance. Although we have talked about it for these many years and are nearly all agreed that something ought to be done, still we have actually accomplished but very little. In former reports I have given my views concerning the general subject of State water-powers and the particular feature of surplus canal waters, but I desire again to discuss these same topics.

With other State officials who have given the matter their attention, I believe that the State should adopt a strong, definite policy in treating the whole broad question of power development and flood control. Moreover, I am very strong in my opinion that prior to any final attempt to solve the problem this many-sided subject should be most thoroughly studied and also should be viewed from every angle, in order that the action which is eventually taken shall benefit with equal fairness both the State and the users of the power.

There is one phase of the subject, however, which demands special treatment, and which, moreover, should have immediate treatment. This is the utilization of power incidentally made available by Barge canal construction. Under the law the State at present is not permitted to dispose of surplus canal waters, and these waters are of such volume that from them there might be generated several thousand horse-power which is now going to waste. I believe that legislative action should be taken, and that without delay, to enable the State to lease this power. The canal interests should, of course, be safeguarded, but on the other hand

INTERIOR OF FREIGHT-HOUSE, PIER 6, NEW YORK CITY

Recently opened to traffic. Shed. 450 by 50 ft., head-house, 75 by 40 ft. Piers 5 and 6, operated as one unit, form the most important down-town canal terminal in New York.

the leases should be attractive enough to appeal to power-users. These power sites are situated on the line of the canal, in close proximity to the remarkable chain of thriving cities and villages that follows the State waterway. From the power thus supplied the State might receive a handsome revenue and at the same time industry would be benefited, since there would be conserved energy which otherwise would go to waste. Action on this matter need not interfere with any general water-power policy which the State may hereafter adopt in its treatment of the broad question of power development and flood control. I commend the subject to your careful consideration.

PROPOSED U. S. GOVERNMENT SHIP CANAL

The ship canal idea will not down. Again this project has come to the fore. It has taken the form now of a proposal for the United States to give financial aid in the construction of a waterway of sufficient size to enable ocean-going vessels to reach the Great Lakes. Some of the Middle Western States are responsible for the passage in Congress of a measure which orders an investigation to determine what further improvement of the St. Lawrence river between Montreal and Lake Ontario is necessary for this purpose, together with an estimate of cost, and a report of recommendations concerning coöperation by the United States with Canada for this improvement. Immediately after the introduction of this measure and before final action could be taken, such bitter opposition arose that the advocates of an all-American route succeeded in having an amendment added, which authorizes a survey for a ship canal between the Great Lakes and the Hudson river.

Possibly the persistence of this ship canal idea is due to a human tendency, particularly an American tendency, to consider that whatever is biggest is necessarily best. It cannot be denied, too, that there is a fascinating glamour enveloping the thought of giant ocean ships penetrating to the heart of the continent and there exchanging the products which they have brought from the uttermost parts of the earth for the grain, the lumber and the ore of the vast Northwest. At the time of adopting the Barge canal as the State waterway policy there were certain fundamental prin-

ciples underlying the project, which determined the selection of a barge rather than a ship canal and these principles were based on careful observation and thorough study. I believe that the reasoning was sound then and cannot see that any new factor has entered the problem to warrant a different conclusion now.

Reduced to a single term, the reason for this selection was that of cost — the greatest economy in cost of transporting cargoes. Underneath this reason, however, there was a certain cause, and this cause had to do with the types of vessels best fitted for particular kinds of navigation. Briefly, it was found that for the highest enconomy in transportation special types of vessels are needed, one for the ocean, one for the lakes and one for the canals, and that no one type can supplant another in its proper waters without suffering loss of economical efficiency. The further conclusion was reached, that it is not possible to combine these three types into one vessel which will be as economical for the through trip as to use the three existing types with two changes of cargo. As I have said, these conclusions were based on actual observations, and it seems to me that unless they can be proved false, sound business reasoning demands that which is based on practical economy and efficiency rather than something supported chiefly by unproved theory or pleasing sentimentality.

If, however, a ship canal is to be built, the most logical route is that known as the Oswego–Oneida Lake–Mohawk River route, in connection with a canal between Lakes Erie and Ontario. This route is practically that followed by the Oswego branch and the eastern half of the Erie branch of the Barge canal. It is the route favored in the report of the United States Deep Waterways Commission, which in 1897–1900 made exhaustive surveys and estimates for a ship canal between the Lakes and the Ocean. Incidentally it may be said that this report, because of the previous report concerning the comparative costs of shipping by ship and barge canals, fell substantially on deaf ears and has been of service only in supplying data used in Barge canal construction.

I have said that the Oswego–Oneida Lake–Mohawk River route is the logical course to be followed if a ship canal must be built. Permit me to state the chief reasons for not coöperating in the St. Lawrence project. It would take the control of the waterway

Traffic on the Barge Canal

Several fleets just having been locked through the first lock at Waterford and starting on the west-bound trip through the canal. Most of the boats shown were built especially for Barge canal use and have dimensions considerably larger than those of the old canal-boats.

out of the hands of the United States, and this condition, I submit, is highly undesirable. Moreover, it would aid Canada far more than it would benefit any section of the United States, for it might divert from our own metropolis the commerce which has long been the bulwark of our growth and prosperity. Although our relations with Canada are most friendly, if the people of the United States realized that the scheme is chiefly in aid of a foreign power at the expense of our own success, I do not believe that they would for a moment look with favor upon the proposal.

There are certain physical conditions, also, which make the St. Lawrence route ill-advised. The river channel is hazardous, the coast along eastern Canada is foggy and extremely dangerous, and the port of Montreal is closed by ice during certain periods of the year. This latter condition is almost fatal to the hopes of any port that aspires to becoming a great ocean trans-shipping center. In contrast, New York with its port open the year around clearly shows its advantage.

Then, too, the return-load factor has always been against Montreal. Statisties show that the entire tonnage into Montreal is considerably less than the tonnage out of Montreal. The reason for this is to be found in the inability of Montreal and the territory tributary to it to absorb enough cargo to fill the ships needed to carry the products out. Here, again, New York stands in sharp contrast, for this port has usually been able to assure full cargoes both ways. This ability, of course, is due to the greater needs and purchasing power of the more highly developed hinterland in the United States. In fact, it would seem that shipping along the North Atlantic has grown up subject to the return-load factor and ports have attracted shipping largely in proportion to their ability to guarantee full loads both in and out. Of necessity this must be so. No elaborate terminals nor deep channels will ordinarily bring and hold shipping unless the territory dependent on the port can supply a cargo out and at the same time absorb a cargo in.

But aside from the relative merits of types of canal or routes of channel, it would seem that the only sensible thing to do now is to give the Barge canal a fair trial and it has not as yet had a fair trial. But something more is needed — something positive, aggressive and definite. And that something, it appears to me, is

a carefully-planned and vigorously-prosecuted campaign of education, and this campaign should cover not only New York state, but should be extended to all the territory adjacent to the Great Lakes. In view of the established fact that the cost of loading and unloading is often equal to or even double the cost of actual carriage, there is a wide field for improvement in terminal facilities. If an adequate and proper program is carried out, shippers will learn the advantages of shipping by water and will demand and get suitable facilities. The possibilities of water transportation are as yet little appreciated, but there is no reason why the Barge canal should not fulfill its function and contribute largely to the general prosperity of our State and Nation.

GRAIN ELEVATORS

One of the most promising fields for exploitation in the development of Barge canal traffic is in the grain trade. When it is considered that from fifty to one hundred million bushels of wheat are received in Buffalo each year and that at the close of navigation we find twenty times as much grain lying in Buffalo harbor, awaiting shipment, as the canal has carried during the whole season, we begin to realize the possibility of the grain trade. And when we perceive further that the vast grain belt lying around and west of the Great Lakes covers an area of 1,250,000 square miles, that it has a population of 30,000,000 and produces annually 5,000,000,000 bushels of grain, we may appreciate fully that, if this class of canal traffic were increased as it might be, the maximum capacity of the canal would not be sufficient for its accommodation. There is no valid reason why the canal should not transport all of the grain it can handle. This commodity is admirably suited to water carriage; for the welfare of the world the cost of shipping it should be as low as possible; the supply is unlimited so far as the canal capacity is concerned, and other carrying agencies are greatly in need of just such relief as the canal could offer. A further fact to remember in regard to the grain belt is that the 30,000,000 people who produce these 5,000,000,000 bushels want to get their surplus products to the markets of the world at the lowest possible transportation cost and that they require for return cargoes the products of the world. Thus

TRAFFIC ON THE BARGE CANAL

A fleet of four Federal-operated boats. Power boats of this type, capable of carrying partial cargoes, have recently been put on the canal. The view is at a point near Rochester where the deepest cut on the canal is located.

they will make our metropolis their port of export and import. It should be remembered also that in order to induce transportation companies to build and operate boats, we must make certain that there will always be full loads of grain available for east-bound trips. In this way, also, we may secure the vessels needful for other commodities and for our west-bound trade.

I have said that there is no valid reason why the Barge canal should not carry its due proportion of grain, but there is a reason why it cannot do this at present. It is plainly evident that the State must build and operate grain elevators.

The crying need is for an elevator at New York. At this port the two existing elevators are owned by railroad companies and there is no shadow of hope that these companies, competing with the canal for this traffic, will allow the canal to use their elevators. Even if they were favorably inclined, their facilities are insufficient for their own use. Such grain as now reaches New York by canal must of necessity, therefore, lie in the barges which bring it until ships are ready to receive the cargoes. Moreover, aside from the question of cost, the useless tying up of boats, which might otherwise be helping to build up canal traffic, is a condition which the State for its own good should hasten to remedy.

Canal officials have for some time perceived the need of a grain elevator at New York and plans have been made with a view of meeting this necessity. At Gowanus bay, Brooklyn, an area has been made available by depositing behind the new bulkhead wall the material from harbor dredging. Also I have planned and built the pier in such a way as to accommodate suitable grain-carrying apparatus. At this terminal there should be erected an elevator with working house and storage bins of ample capacity to meet the needs of the present and also of at least the near future, but so arranged that any required number of bins may easily be added as traffic increases.

At Buffalo there is not an actual lack of elevators, such as exists in New York, but for some reason the boatmen cannot seem to make satisfactory arrangements with the elevator owners to receive the amount of grain they desire and on terms which will make its transportation profitable. An elevator owned and operated by the State will doubtless remedy this trouble.

The necessity for a grain elevator at Oswego is almost as pressing as for one at New York. It is anticipated that the improvement of the Welland canal, which is now in progress, will to some extent cause lake boats to pass Buffalo and discharge their loads at ports at the eastern end of Lake Ontario — either Canadian or United States ports, as advantageous circumstances dictate. To participate in the grain trade following this course, the Barge canal must be equipped with a suitable elevator at Oswego.

This whole subject of State-owned and State-operated grain elevators is so important and, moreover, so essential to the material prosperity of our great canal system that it deserves your earnest and speedy attention. I therefore commend it to your consideration.

BARGE CANAL TERMINALS

The work of building and equipping Barge canal terminals has been steadily progressed during the year. This was the last portion to be undertaken in Barge canal construction, and although operations have been pushed as rapidly as circumstances have permitted, it will be the last part to be completed. Moreover, there are some phases of the terminal problem in which it is advisable to proceed cautiously. It may be predicted that a certain volume of traffic or a particular class of commodities will be handled at a given terminal, but experience may prove these opinions incorrect. Accordingly temporary freighthouses and partial installations of freight-handling machinery have been the policy in numerous cases. I have called these freighthouses temporary, but they have been well built and will last for years and the State will get full value for the money expended.

The work of the year has been the construction of certain docks, piers and warehouses and the installation of freight-handling machinery and electrical equipment. The New York city terminals have received the major part of our attention, but operations of more or less magnitude have been going on at other localities.

In the following paragraphs I shall take up the various terminals in order, beginning with those in New York city, and briefly describe what has been done.

ROOF CRANES AT PIER 6, NEW YORK CITY

These two 1½-ton roof cranes have been installed here. One is seen with its boom in a vertical position, ready for traveling along the roof, while the other is shown operating, a load being carried along its nearly horizontal boom.

At Pier 5 the repairs to the pier were completed. At Pier 6 the freighthouse was completed and the pier was paved. These two piers are operated as one unit and were turned over to the Superintendent of Public Works in a formal ceremony on October 14, 1919. The New York offices of the State Engineer and the Superintendent of Public Works are now located in the headhouse on Pier 6. There have been installed a complete lighting system for the offices and freightshed, and a power-distributing system for supplying current to semiportal revolving jib cranes, roof cranes, a portable conveyor, a tiering machine, capstans and a battery-charging equipment. Two 1½-ton roof cranes, five capstans, one tiering machine, one portable conveyor and a large number of hand trucks and trailers have been furnished and installed and two 3-ton semiportal revolving jib cranes are under contract and probably will be installed early in 1920. The power is brought underground to a switchboard in the freighthouse and thence distributed to the various circuits. From the same switchboard a circuit is carried to Pier 5 for operating the machinery there. Pier 5, for the present at least, is not to have any freightshed. It has been in constant use since the State took possession, even during the period when repairs were in progress.

At West 53d street the pier has been completed and the piershed is well under way. A contract has recently been awarded for building a headhouse. Work is also progressing in installing complete lighting, power-distributing and battery-charging systems. There have been delivered and installed capstans and a quantity of trailers and hand trucks. Two 3-ton semiportal revolving jib cranes, which are under contract, are expected to be installed early in 1920.

At Mott Haven the dockwall has been completed and the site has been paved. The interior of an existing brick building has been remodeled, so as to adapt it for use as a storage warehouse. Lighting and battery-charging equipments have been installed and hand trucks and trailers have been delivered.

At Flushing, work has been started in driving foundation piles for the dockwall and the frame freighthouse.

A contract for dredging and building a dockwall at Hallets Cove was awarded on November 26, 1919.

At Long Island City an existing bulkhead has been repaired, the site has been paved and a freighthouse is nearly completed. Complete lighting, power and battery-charging equipments have been installed.

At Greenpoint the new pier has been completed and alterations have been made in an existing concrete warehouse so as to adapt it for storage use. A shed on the new pier is nearly completed. A lighting system has been installed in the concrete warehouse, making it available for use the coming season. Provision is also being made for power and battery-charging installation for use in 1920. The battery-charging equipment and capstans have already been delivered and two semiportal revolving jib cranes are under contract. Also hand trucks and trailers have been delivered.

At Gowanus bay, work on the 1,200-foot pier has continued and a frame freighthouse has been built. The area for a depth of 60 feet behind the bulkhead wall has been paved, as has also the approach from Columbia street. The permanent freighthouse to be constructed on the pier will be 106 feet wide and 1,180 feet long. It differs from others on canal terminals in that it will have cargo masts along one side, these masts to be used in unloading ships by the burtoning method. Also the design is such as to permit the future addition of a conveyor gallery on the side of the house where the masts are placed. Should a grain elevator be erected, this addition of a conveyor gallery would be a part of that project. As I have said in former reports, from the beginning of terminal construction, those in authority have perceived the necessity of a commodious grain elevator in New York city, set apart especially for canal traffic. The site at Gowanus bay was best fitted for this elevator and all of the plans have been made with its possible erection in view.

Dredging operations to secure required depths of water have been in progress at three New York terminals — Piers 5 and 6, Long Island City and Greenpoint.

Apart from New York city the most important terminal construction has been at Buffalo. At Erie basin there is being erected a freighthouse, 80 by 500 feet in size, the freight section having a steel framework and the two-story office section, 80 by

BARGE CANAL TERMINAL AT LONG ISLAND CITY

At this place an existing bulkhead became serviceable by making certain repairs. The area has been paved and a freight-house built.

40 feet, having a reinforced concrete frame. The walls are of brick with artifical stone trim. This office section will house the Buffalo offices of the State Engineer and the Superintendent of Public Works. The building and the electric installation, which includes provision for lighting, power and battery-charging systems, is well advanced and is expected to be ready for use at the beginning of the 1920 navigation season. Tracks have been laid on both piers and railroad connections made. This terminal will be primarily the point of transfer between the lake craft and canal barges, but local traffic can also be handled.

At Ohio basin progress has been made in dredging the entrance channel and the Ohio street bascule bridge has been erected.

At Rochester a contract for a portion of the Court street viaduct, which forms an approach to the terminal, was awarded and nearly completed during the year. A contract for a temporary approach from Griffith street has recently been let. This contract includes also a 32 by 200-foot temporary freighthouse.

At Syracuse a frame freighthouse and timber derricks were completed. The house occupies the south pier. The work of constructing the harbor and piers was completed prior to a year ago.

At Utica the only work was in completing the pavement behind the freighthouse. The extension to the house had been finished before the first of the year.

At Amsterdam the second freighthouse and the pavement around the two houses were completed, although the greater part of this work was done in 1918.

At Albany the little work required to finish the freighthouse was completed.

At Whitehall the situation was similar to that at Albany and a small amount of work was needed to complete the freighthouse. The houses at Albany and Whitehall were alike in general character and were erected under the same contract.

At Oswego, track connection was made between the Delaware, Lackawanna and Western Railroad and the lake terminal.

The freight-handling machinery adopted at the various canal terminals include full-portal and semiportal traveling and revolving jib cranes of 3-ton capacity, 1½-ton traveling roof cranes, light

and heavy duty stiff-leg derricks, package conveyors, burtoning devices, dock winches, capstans, carrying trucks and battery tractors. These are all electrically operated. The steam operated devices are locomotive cranes and small tractor cranes. There are also hand trucks and trailers, the latter being intended primarily for use in connection with battery tractors, but they may be operated by hand, if occasion demands.

WORK REMAINING IN COMPLETING TERMINALS

Another year has passed since I last called your attention to the fact that the funds available for constructing Barge canal terminals are all spent or obligated and that an additional sum is needed to bring these terminals to the degree of efficiency demanded by the needs of the canal, or even to the point contemplated when the original appropriation was made. The reason for this insufficiency of funds is apparent. Since the terminal work was begun the cost of labor and materials has advanced enormously. Under the act calling for compensation to contractors for increased costs due to war prices another extra toll was taken, and the early purchase of high-priced sites for New York city terminals has had its share in reducing the fund. Moreover, the original law did not provide for all of the terminals which properly should be built.

Several times I have set forth in my reports the imperative necessity of having canal terminals and especially of providing adequate freight-handling machinery. State-controlled docks and warehouses are needed to insure all shippers and boatmen an approach to the canal, but efficient handling devices are the chief means of reducing costs. To the uninformed, the ratio which the costs of loading and unloading bear to the cost of actual carriage is almost beyond belief.

The Barge canal must compete with the railroads and also with the Canadian canals. With all the obstacles it has to overcome — ignorance, indifference, prejudice, open opposition, sharp competition and the inertia of established commerce — it must be able to reduce shipping costs to a minimum. There is no field so fertile for reducing these costs as is that of terminal expenses. I recommend, therefore, that this subject receive your earnest attention.

Movable Dam at the Foot of Rochester Harbor

Sector gate type of dam on the left, bridge type on the right. In removing the dam the sector gates are lowered into a recess and the bridge gates are raised and swung up under the bridge floor.

HUDSON RIVER TERMINALS

An appropriation for purchasing Barge canal terminal sites at Poughkepsie, Kingston, Newburgh and Yonkers was made by the Legislature of 1918. Preliminary surveys to secure data for acquiring the sites and for making plans were made during 1918. The lands have now been secured and studies have been made to determine the character of terminal construction needed.

The original Terminal Law made no provision for terminals on the Hudson between New York and Albany. By its action in 1918 the State has, in effect, pledged itself to the construction of these four terminals. The time is now ripe for the fulfillment of that pledge and I recommend that the appropriation necessary to proceed with this construction be made available.

INDUSTRIAL SITES ALONG CANAL

The recent purchase of three parcels of land near the Barge canal terminal at Syracuse by three large oil companies lends emphasis to a suggestion I have made in former reports concerning the availability of abandoned canal lands as sites for industrial plants. A few large companies, notably the General Electric Company and the Standard Oil Company, are appreciating the Barge canal and are making use of it. It would seem that only a knowledge of conditions is required to convince others of the value of water transportation. To such as are seeking industrial sites the abandoned canal lands present excellent locations. These are generally near the new canal, are not far from railroads and are in convenient proximity to power from surplus canal waters, the utilization of which seems destined to eventuate before long.

SCHENECTADY-SCOTIA BRIDGE

The bridge between Schenectady and Scotia, sometimes called the Great Western Gateway bridge, is in a sense a part of Barge canal construction, but it cannot really be regarded as such because of the design being more elaborate than canal interests demand. A large special appropriation, together with funds raised by Schenectady and Scotia, is needed in addition to the sum set aside from the Barge canal fund for a bridge at this location. Under authority of an act of 1917 I made careful plans and estimates of

this bridge and reported my findings to the Legislature. By an act of 1919 construction along the line of these plans was ordered. Immediately after the passage of this act I reorganized a part of my force so as to get the work ready for letting with the least possible delay. It was decided to divide the work into four contracts. The first of these includes the abutments and approaches, exclusive of paving, at both Schenectady and Scotia; the second is for the piers below the undercoping; the third provides for the entire superstructure, while the fourth takes care of the paving.

The new bridge is to be situated about a half-mile west of the bridge which now forms the link between Schenectady and Scotia. It is to be of reinforced concrete arch construction, having 23 arches with spans ranging from 106 to 212 feet. The length of the concrete structure is 3,186 feet and the approaches bring the total length to 4,436 feet.

Bids were opened for the first contract last September, but unfortunately, because Scotia's share of the funds was not available, the possibility of making an award was delayed for about three months. At the end of that time the lowest bidder declined to accept the contract, claiming that prices had advanced and his options had been for thirty days and he could not perform the work for the amounts in his bid. The second lowest bidder was given an opportunity to take the work at his proposal, but he also declined, and now the contract is being readvertised for a second opening of bids. It seems probable that the new bid will exceed the original bid by many thousand dollars. The plans for the second contract are now completed.

BLUE LINE SURVEYS AND SALE OF ABANDONED CANAL LANDS

During the past year progress has been made in computing the blue line surveys and maps on which the abandonment and sale of old canal lands is based. The work of mapping these old canal lands has been principally confined to sections where there was a prospect of making a sale of the lands involved.

So far as this Department is concerned, this work has reached such a stage that the greater portion of the lands to be sold can be

WAREHOUSE, ERIE BASIN TERMINAL, BUFFALO

The walls are of brick with artificial stone trim. The office section, in addition to serving the terminal, houses the Buffalo offices of the State Engineer and the Superintendent of Public Works.

disposed of during the coming year; this includes old canal lands in the cities of Utica, Syracuse and Rochester, from the sale of which the State should receive considerable revenue. From the sales made to date of January 1, 1920, embracing seven miles of old canal, the State has realized $426,818.56.

REORGANIZATION OF DEPARTMENT

At the time the Barge canal and terminal construction was under full headway over 90 per cent of the cost of maintaining this Department was paid out of bond moneys. As this work was brought toward completion the force was reduced. It is apparent that of the force remaining in the employ of the Department the greater portion of their time is devoted to maintenance of the canal and work other than construction. It is evident that this force should no longer be charged against a bond issue provided for construction only, so that the amount requested from the Legislature to run the Department has been based on the transfer of these employees to the payroll to which they should be equitably charged. The cost of maintaining the new canal will be much in excess of the cost of maintaining the old system, and with a complete understanding of the situation it is not surprising that so far as legislative appropriations are concerned, the cost of running the Department aside from construction is increased.

In the budget requests for the coming fiscal year, provision has been made to place the Department in a position to undertake such work as it may be called upon to perform as the engineering department of the State. The only employees charged to bond moneys will be those directly connected with the completion contracts on canals and terminals. If the new budget requests are granted, it will be unnecessary to make an appropriation to meet the engineering expense of each new activity undertaken by the State and this Department will be organized to furnish such engineering advice through the regular employees of the Department who are paid out of the regular departmental appropriation received from the Legislature.

During the past year this Department joined with the Highway Commission and the Conservation Commission in a request to the Civil Service Commission for a readjustment of the salary grades

for engineers. With the approval of the Governor, the Civil Service Commission adopted these new grades and the same are now in effect. This provides for increases in the compensation of engineers, to which in my opinion they are justly entitled. I trust in considering the requests for appropriations for personal service the Legislature will look with favor to the payment to the engineers of the salaries as set forth in the new schedule which applies to these various positions.

APPENDED REPORTS

The usual reports and tables are hereto appended. First in order are the tables which give summaries of engineering expenses. These are followed by tables of contracts, both those completed during the fiscal year and those in force at its close. A table which summarizes, by years and canals, the work of constructing the Barge canal and its terminals completes the chief tabular appendices. Next in order are the reports of the three Division Engineers. They give in detail the accounts of nearly all the engineering and contract work that has been in progress. A detailed tabular statement of engineering expenditures accompanies each Division Engineer's report. Other reports covering activities of the Department are appended.

ACKNOWLEDGMENTS

During the past year the relationship existing between this Department and the Department of Public Works has been most cordial and I desire to acknowledge the assistance rendered and the spirit of coöperation shown at all times by the Superintendent of Public Works, Edward S. Walsh.

The employees of this Department have continued to render faithful and efficient service, for which I desire to express my thanks.

Respectfully submitted,

FRANK M. WILLIAMS,

State Engineer and Surveyor.

ENGINEERING EXPENSES FOR THE FISCAL YEAR ENDED JUNE 30, 1919

TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED JUNE 30, 1919

TABLE OF CONTRACTS PENDING JUNE 30, 1919

SUMMARY OF CONSTRUCTION WORK, BARGE CANAL AND TERMINALS, BY YEARS

ENGINEERING EXPENSES FOR THE FISCAL YEAR ENDED JUNE 30, 1919

Ordinary Repairs to Canals

WORK	Act		Division	Amount	Total
	Chap.	Year			
Erie canal	151	1918	Eastern	$6,577 24	
Champlain canal	151	1918	Eastern	3,422 76	$10,000 00
Erie canal	151	1918	Middle	$9,754 55	
Black River canal	151	1918	Middle	230 37	9,984 92
Erie canal	151	1918	Western	$10,000 00	10,000 00
Total	......	......	....	....	$29,984 92

Construction of Barge Canal

WORK	Act		Division	Amount	Total
	Chap.	Year			
Head office account	147	1903*	Eastern	$212,966 79	
Erie canal	147	1903*	Eastern	52,236 90	
Champlain canal	147	1903*	Eastern	34,015 76	$299,219 45
Erie canal	147	1903*	Middle	$48,060 81	
Oswego canal	147	1903*	Middle	16,651 74	
Cayuga and Seneca canal	391	1909*	Middle	11,077 62	75,790 17
Erie canal	147	1903*	Western	$138,480 98	138,480 98
Total	......	......	....	....	$513,490 60

Construction of Barge Canal Terminals

WORK	Act		Division	Amount	Total
	Chap.	Year			
Eastern division account	746	1911*	Eastern	$153,691 78	
Middle division account	746	1911*	Middle	18,765 19	
Western division account	746	1911*	Western	26,980 94	
Total	......	......	....	....	$201,437 91

* And amendatory laws.

Hudson River Terminals

WORK	Act		Division	Amount	Total
	Chap.	Year			
Hudson river terminals	555	1918	Eastern	$4,816 58	$4,816 58

Bridge Designers, Engineers, etc.

WORK	Act		Division	Amount	Total
	Chap.	Year			
Bridge designers, engineers, etc	151	1918	Eastern	$2,000 00	$2,000 00

Special Work

WORK	Act		Division	Amount	Total
	Chap.	Year			
High street bridge, Cohoes	181 151	1917 1918	Eastern	$820 98	
Schenectady–Scotia bridge	735 634	1917 1919	Eastern	3,356 02	
Sea-wall, Orient–East Marion	428	1918	Eastern	739 52	$4,916 52
Glen creek improvement	341	1918	Middle	$120 87	
Dive culvert, Rome	346	1918	Middle	100 89	
Lake street bridge, Geneva	351	1918	Middle	425 41	
Minetto bridge	716	1915	Middle	1,371 20	
Limestone creek improvement	751	1917	Middle	14 18	
Canandaigua lake dredging	756	1917	Middle	1,003 75	
Cowasselon creek dredging	781	1917	Middle	419 15	
Whitesboro street bridge, Rome	753	1917	Middle	1,324 60	4,780 05
Chadakoin river improvement	758 728 181 644	1913 1915 1917 1919	Western	$555 05	
Ellicott creek improvement	624 728 181 760	1913 1915 1917 1917	Western	2,195 79	
Hertel avenue bridge, Buffalo	761	1917	Western	1,625 78	
Eighteen-Mile creek culvert, Lockport	181 626	1917 1917	Western	56 80	
Griffin creek improvement, Cuba	565	1918	Western	397 40	4,829 82
Total	......	......	....	....	$14,526 39

Special Surveys

WORK	Act Chap.	Act Year	Division	Amount	Total
Blue line surveys	151	1918	Eastern	$15,000 00	
Surveys for State Court of Claims	151	1918	Eastern	200 00	
Department surveys	151	1918	Eastern	3,627 93	
State boundary	151	1916	Eastern	378 26	
Delaware-Schoharie county boundary line	559	1918	Eastern	2,375 55	
Saratoga-Warren county boundary line	561	1918	Eastern	2,476 80	
Ulster-Greene county boundary line	562 600	1918 1919	Eastern	3,682 69	
Land grants	151	1918	Eastern	2,710 69	
Survey of lands under water	12	1918	Eastern	912 54	
Jamaica Bay-Peconic Bay canal	317 343	1917 1918	Eastern	4,177 99	
Mill river survey	427	1918	Eastern	466 55	
Hydrographic survey	181 151	1917 1918	Eastern	2,932 93	
					$38,941 93
Blue line surveys, Erie canal	151	1918	Middle	$17,116 14	
Blue line surveys, Oswego canal	151	1918	Middle	266 13	
Survey for State Court of Claims, Erie canal	151	1918	Middle	2,494 29	
Survey for Hospital Development Commission, Utica State hospital, Marcy division	151	1918	Middle	1,792 41	
					21,668 97
Blue line survey	151	1918	Western	$10,500 00	
Survey for State Court of Claims	151	1918	Western	2,150 00	
Eighteen-Mile creek, Niagara county	425	1918	Western	2,333 74	
					14,983 74
Total	......	......	....	....	$75,594 64

Summary of Engineering Expenses for the Fiscal Year Ended June 30, 1919

DIVISION	Ordinary repairs to canals	Construction of Barge canal	Construction of Barge canal terminals	Hudson river terminals	Bridge designers, engineers, etc.	Special work	Special surveys	Totals
Eastern and head office	$10,000 00	$299,219 46	$155,691 78	$4,816 58	$2,000 00	$4,916 52	$38,941 93	$515,586 26
Middle	9,984 92	75,790 17	18,765 19	....	....	4,780,05	21,668 97	130,989 30
Western	10,000 00	138,480 98	26,980 94	....	....	4,829 82	14,983 74	195,275 48
Totals	$29,984 92	$513,490 60	$201,437 91	$4,816 58	$2,000 00	$14,526 39	$75,594 64	$841,851 04

TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED JUNE 30, 1919

Special Work

CONTRACTOR	Date of contract	Character of work	Division	Act: Chap.	Act: Year	Appropriation	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
Rosoff Engineering Co.	June 12, 1918	Constructing a concrete pavement on State reservation, Rockaway Point	Eastern	130	1917	*	$35,995 00	$48,126 25	$45,980 95
Rosoff Engineering Co.	Oct. 18, 1918	Completing sea-wall between East Marion and Orient	Eastern	428	1918	*	6,812 00	9,109 00	8,818 81
A. M. Hazell, Inc.	Jan. 3, 1918	Repairs to landing pier, Quarantine station, Hoffman island, New York harbor	Eastern			†		3,387 00	4,152 00
Anderson & Wheeler	June 26, 1918	Repairs to north pier, Quarantine station, Hoffman island, New York harbor	Eastern			†			4,562 02
M. Fitzgerald	Sept. 9, 1918	Elimination of High street bridge, Cohoes	Eastern	181 151	1917 1918		12,264 50	12,351 75	12,283 50
Walter S. Rae	Oct. 25, 1917	Constructing a steel bridge over the Black River canal at Whitesboro street, Rome	Middle	753	1917	$15,000 00	12,085 00	11,872 30	11,142 86
Robert Provo	Nov. 30, 1917	Dredging and improvement of Cowaselon creek, between Canastota and Lakeport	Middle	781	1917	12,000 00	10,120 00	10,380 00	9,572 70
Larkin & Sangster	Sept. 12, 1916	Constructing portions of a bridge over the Oswego river at Minnetto. (Part of Barge canal contract No. 99)	Middle	716 181	1915 1917	50,000 00	44,088 15	42,988 15	§
W. F. Martens	May 6, 1918	Dredging harbor and repairing pier and break-water at Canandaigua	Middle	756	1917	16,500 00		15,097 00	12,650 94
J. W. Hennessy, Inc.	April 18, 1918	Improvement of Ellicott creek, Erie county	Western	760 181	1917 1917	88,711 38	83,803 25	86,885 30	77,281 96
Lupfer & Remick	Mar. 15, 1918	Construction of a steel through-truss bridge over the old Erie canal at Hertel avenue, Buffalo	Western	761	1917	30,000 00	27,937 50	27,967 20	25,311 20
Geo. L. Maltby	Mar. 23, 1916	Improvement of Chadakoin river, Chautauqua county	Western	758 728	1913 1915	100,000 00	89,252 25	92,074 25	¶

* Work done under an act which, in addition to making provision for the acquisition of land, appropriated $100,000.00 for highway improvement, for purposes of public defense.

† These contracts have been prepared and the work was supervised by this Department for the Health Officer of the port of New York. The funds were available from appropriations for the use of this officer.

§ Payment for work done was made under chapter 583, Laws of 1918. Part of contract No. 99 was in this payment and could not be separated.

¶ Contract finished under direction of Superintendent of Public Works.

Construction of the Barge Canal

Chapter 147, Laws of 1903; chapter 391, Laws of 1909; and amendatory laws

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
Holler & Shepard	Aug. 31, 1914	Contract No. 1-A, Champlain canal — Hudson river, Northumberland to Fort Miller and Crockers Reef to Fort Edward	Eastern	$90,811 00	$141,540 20	*$211,604 61
H. S. Kerbaugh, Inc	Nov. 3, 1916	Contract No. 19-A, Erie canal — Redredging contract No. 19	Western	152,200 00	169,750 10	*236,943 42
Walsh Construction Co	Feb. 16, 1916	Contract No. 21-A, Erie canal — Completing canal, Genesee river to contract No. 6	Western	415,700 00	428,475 54	*620,327 60
H. S. Kerbaugh, Inc	May 20, 1916	Contract No. 23-A, Erie canal — Completing canal, King's Bend to Genesee river	Western	651,703 10	745,672 12	*979,919 99
Eastover Construction Co., Inc	Mar. 27, 1916	Contract No. 29-A, Erie canal — Completing canal, Sterling creek to Herkimer-Oneida county line	Eastern	162,005 00	318,659 70	*371,498 20
Grant Smith & Co., & Locher	Feb. 24, 1913	Contract No. 42-A, Erie canal — Completing canal, Herkimer-Oneida county line to Oriskany road	Middle	1,033,037 85	1,239,045 03	1,197,244 78
Scott Bros	Oct. 10, 1916	Contract No. 44-A, Erie canal — Completing prism near junction lock at New London	Middle	57,050 00	52,486 00	*56,242 37
Scott Bros	Feb. 25, 1916	Contract No. 46-B, Erie canal — Lock, dam, etc., at May's Point	Middle	314,660 72	293,676 97	269,398 41
State Highway Construction Co	Feb. 23, 1916	Contract No. 63-A, Erie canal — Completing canal, west line of Wayne county to King's Bend	Western	567,745 70	581,861 50	*387,777 24
Great Lakes Dredge and Dock Co	Jan. 15, 1916	Contract No. 73-A, Champlain canal — Completing canal from Northumberland to Stillwater	Eastern	432,045 00	506,169 67	*577,985 82
Mohawk Dredge and Dock Co	Oct. 22, 1917	Contract No. 83, Erie canal — Canal at Tonawanda and removing guard-lock and coffer-dam	Western	149,604 50	195,351 00	158,466 60
Lupfer & Remick	Mar. 9, 1917	Contract No. 84, Erie canal — Viaduct over Clyde river at Clyde	Western	83,984 50	83,876 66	*89,390 37
The Holington Co	Jan. 5, 1911	Contract No. 91, Erie canal — Hydro-electric power-plant at Crescent dam	Eastern	44,600 00	44,985 50	40,458 32
Tifft Construction Co., Inc	Nov. 24, 1916	Contract No. 98, Erie canal — Adams street lift-bridge, Lockport	Western	77,496 60	82,426 25	*83,380 98
Larkin & Sangster	Sept. 12, 1916	Contract No. 99, Oswego canal — Bridge over Oswego river at Minetto	Middle	117,170 75	115,980 75	*152,347 24
Chelsey, Earl & Heimbach, Inc	Mar. 8, 1917	Contract No. 122-A, Erie canal — Completing highway bridge near Little Falls	Eastern	52,717 00	67,377 00	81,716 95
M. Fitzgerald	Mar. 5, 1917	Contract No. 131-A, Champlain canal — Completing portion of a highway bridge at Schuylerville	Eastern	30,753 00	39,634 50	37,267 28

TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED JUNE 30, 1919 — (*Continued*)

Construction of the Barge Canal—(Continued)

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
W. F. Maas & Son	Mar. 8, 1917	Contract No. 141, Erie canal — Power-station at lock No. 29, Palmyra	Western	$41,166 50	$41,180 75	$27,457 82
W. F. Martens & Co., Inc	June 14, 1917	Contract No. 144, Erie canal — Two concrete bridges over Red creek, Genesee Valley park, Rochester	Western	41,480 70	41,258 70	†6,580 00
Chelsey, Earl & Heinbach, Inc	Aug. 28, 1917	Contract No. 156, Erie canal — Highway bridge near Sylvan Beach	Middle	7,788 00	10,113 00	9,643 30
I. M. Ludington's Sons, Inc	Mar. 27, 1917	Contract No. 159, Erie canal — Extending Ganargua creed spillway and raising canal bank nearby	Western	30,464 00	43,258 53	40,684 26
Lord Construction Co	Aug. 3, 1917	Contract No. 161, Erie canal — Electric motors and machinery for guard-locks at Rochester	Western	5,972 00	15,867 35	15,750 20
Mohawk Dredge & Dock Co., Inc	Nov. 23, 1917	Contract No. 165, Erie canal — Removing Montezuma aqueduct	Middle	84,530 00	160,943 00	145,798 26
Cleveland & Sons Company	Nov. 10, 1917	Contract No. 170, Erie canal — Junction lock at South Greece	Western	54,800 50	64,942 50	56,444 24
Lupfer & Remick	Mar. 15, 1918	Contract No. 172, Erie canal — Barrel buoys and lamp-posts on the Seneca, Clyde, Genesee and Tonawanda rivers	Middle and Western	14,853 00	12,921 45	12,913 35
Dunbar & Sullivan Dredging Co	Mar. 15, 1918	Contract No. 180, Erie canal — Removing part of aqueduct at Rexford Flats	Eastern	17,840 00	15,958 00	16,153 54
Law Brothers	Dec. 28, 1917	Contract No. 181, Erie canal — Lining and water-proofing prism at Little Falls	Eastern	46,624 00	48,253 50	48,222 72
Donnell-Zane Co	Sept. 11, 1918	Contract No. 183, Erie canal — Aligning bridge, west Henrietta road, Rochester	Western	6,850 00	5,915 25	5,504 53
Mohawk Dredge & Dock Co., Inc	April 12, 1918	Contract No. 184, Erie canal — Excavating under N. Y. C. R. R. bridge at Brewerton	Middle	7,200 00	9,480 00	9,562 95
Lupfer & Remick	Nov. 5, 1914	Contract M, Cayuga and Seneca canal — Electrical and operating equipment for locks Nos. 1, 2, 3 and 4	Middle	176,087 00	191,405 00	190,274 64
The Sherman-Stalter Co	April 30, 1918	Contract R, Cayuga and Seneca canal — Completing unfinished work on Cayuga and Seneca canals	Middle	185,259 00	180,122 80	173,434 38
Smith Soper	Jan. 3, 1919	Contract U, Cayuga and Seneca canal — Repairing manholes of sewer in Benton creek, Seneca Falls	Middle	5,941 00	7,382 00	5,147 68

* Final payment made under chapter 585, Laws of 1918. † Canceled May 7, 1919.

Special Work Connected with Barge Canal Construction

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
Superintendent of Public Works	....	Erie canal — Completing contract No. 47-A, east line of Wayne county to Lyons	Western	....	....	$917,880 30
State Engineer	....	Erie canal — Completing contract No. 84, viaduct over Clyde river at Clyde	Western	....	....	3,799 20

TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED JUNE 30, 1919 — (*Concluded*)

Construction of Barge Canal Terminals

Chapter 746, Laws of 1911, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Final payment
James P. Kelly	April 15, 1918	Terminal contract No. 8-P — Paving terminal at Schenectady	Eastern	$8,400 00	$8,400 00	$8,187 55
Patrick W. Mulderry	April 12, 1918	Terminal contract No. 10-P — Paving terminal at Fonda	Eastern	8,602 00	8,700 00	8,054 40
Anchor Post Iron Works	April 16, 1918	Terminal contract No. 12-F — Fence at Amsterdam terminal	Eastern	1,289 00	1,379 50	1,355 25
Lufper & Remick	Oct. 31, 1917	Terminal contract No. 15-M — Electrical equipment for the Utica terminal	Middle	30,681 20	36,967 50	37,069 72
Walsh Construction Co., Inc.	Nov. 4, 1915	Terminal contract No. 20 — Terminal basin with connecting channel to Onondaga lake at Syracuse	Middle	665,875 00	549,878 26	*644,309 05
Henry P. Burgard Co.	May 6, 1918	Terminal contract No. 21-P — Paving part of terminal at Erie basin, Buffalo	Western	14,180 00	14,350 00	13,066 00
John E. Byron & Co.	Oct. 30, 1916	Terminal contract No. 26 — Dredging and constructing pier at Rouses Point	Eastern	51,200 00	55,678 50	*23,456 67
Patrick W. Mulderry	April 12, 1918	Terminal contract No. 27-P — Paving terminal at Frankfort	Eastern	4,100 09	4,446 00	3,938 45
Barrally & Ingersoll	Nov. 27, 1914	Terminal contract No. 29 — Harbor, dockwall and breakwaters on Oneida lake at Constantia	Middle	43,573 50	39,793 50	†3,400 00
Henry P. Burgard	Mar. 24, 1916	Terminal contract No. 30 — Dockwall and approach on east side of Oswego river at Oswego	Middle	103,700 00	106,166 70	100,382 70
Lupfer & Remick	Sept. 30, 1916	Terminal contract No. 31 — Terminal at Lyons	Western	57,925 00	51,653 80	*56,521 09
Guy B. Dickison	May 27, 1918	Terminal contract No. 33-P — Paving part of terminal pier at Oswego	Middle	11,010 00	11,730 00	11,329 00
Troy Public Works Co.	Mar. 27, 1917	Terminal contract No. 36 — Terminal at Cohoes	Eastern	61,000 00	57,600 00	*30,611 23
Holler & Shepard	Aug. 26, 1915	Terminal contract No. 37 — Dockwall and harbor at Canajoharie	Eastern	33,832 00	32,272 00	31,436 63
Geo. W. Rogers Co., Inc.	June 8, 1917	Terminal contract No. 44 — Terminal at Mott Haven	Eastern	170,300 00	191,195 50	176,110 73
M. H. Ripton	Oct. 19, 1916	Terminal contract No. 48 — Terminal on east side of Genesee river at Rochester	Western	101,000 00	93,828 00	*94,766 00
Kaufman & Garcey	July 27, 1916	Terminal contract No. 52 — Terminal at Pier 6, East river, New York city	Eastern	89,974 00	102,553 75	*132,148 66
I. J. Stander & Co., Inc.	une 28, 1918	Terminal contract No. 56 — Repairing Pier 5, East river, New York city	Eastern	20,400 00	27,159 60	26,904 68
W. F. Martens	May 6, 1918	Terminal contract No. 59 — Railroad approach to terminal pier at Oswego	Middle	5,100 00	6,516 00	5,391 41

W. F. Martens	May 6, 1918	Terminal contract No. 60 — Railroad and crane tracks on terminal pier at Oswego	Middle	8,365 00	9,690 00	9,119 00
H. W. Roberts & Co.	April 19, 1918	Terminal contract No. 63 — Railroad tracks and brick pavement on terminal at Utica	Middle	9,590 00	7,672 00	7,632 13
Robert Wetherill, Receiver, American Pipe & Construction Co.	April 24, 1918	Terminal contract No. 64 — Railroad and crane tracks on terminal at Schenectady	Eastern	9,000 00	10,021 30	10,227 44
Mohawk Dredge & Dock Co., Inc.	Dec. 18, 1916	Terminal contract No. 101 — Stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda	Eastern, Middle and Western	21,890 90	31,790 90	36,611 92
The John F. Byers Machine Co.	Feb. 14, 1918	Terminal contract No. 106 — Fourteen two-ton tractor cranes for various terminals	Eastern, Middle and Western	73,500 00	77,210 00	77,210 00
J. A. Laporte	Jan. 2, 1917	Terminal contract No. 201 — Terminal warehouses at Albany and Whitehall	Eastern	59,300 00	71,432 30	*54,234 39
Savage Construction Co.	Feb. 14, 1918	Terminal contract No. 213 — Freight-house and four derricks at Syracuse	Middle	28,200 00	26,997 00	26,346 40
Kennedy & Scullen Construction Co.	April 26, 1918	Terminal contract No. 214 — Freight-house and pavement at Amsterdam	Eastern	16,478 00	16,323 00	14,709 00
Savage Construction Co.	July 9, 1918	Terminal contract No. 216 — Frame freight-house, Erie basin, Buffalo	Western	10,000 00	9,899 00	10,116 00
James T. Young	Aug. 12, 1918	Terminal contract No. 220 — Addition to freight-house at Utica	Middle	5,000 00	5,495 00	5,324 40
Kennedy & Scullen Construction Co.	Aug. 30, 1918	Terminal contract No. 221 — Freight-house at Herkimer and an extension to freight-house at Little Falls	Eastern	6,100 00	6,122 00	5,914 10
J. A. Laporte	Aug. 23, 1918	Terminal contract No. 222 — Freight-house and roadway at Canajoharie	Eastern	4,000 00	4,195 00	4,206 40

* Final payment made under chapter 585, Laws of 1918.
† Canceled August 8, 1917.

TABLE OF CONTRACTS PENDING JUNE 30, 1919

Special Work

CONTRACTOR	Date of contract	Character of work	Division	Act Chap.	Act Year	Appropriation	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1919
Scott Bros.	June 6, 1919	Constructing 8-foot pipe culvert across Barge canal at Rome	Middle	346	1918		$42,811 20	$46,731 20	$0 00
E. Brown Baker	Nov. 23, 1918	Lake street bridge, Geneva	Middle	351	1918		55,811 00	70,400 00	3,650 00
Russell R. Ames	Jan. 30, 1919	Constructing a concrete culvert over Eighteen-Mile creek, Lockport	Western	626	1917	$12,500 00	10,805 00	11,236 00	*340 00
Savage Construction Co.	May 31, 1919	Constructing a concrete culvert over Eighteen Mile creek, Lockport	Western	626	1917	12,500 00	10,805 00	11,070 00	0 00
Geo. L. Maltby	Mar. 23, 1916	Improvement of Chadakoin river, Chautauqua county	Western	758 728	1913 1915	100,000 00	89,252 25	92,074 25	†8,570 00
Superintendent of Public Works		Improvement of Chadakoin river, Chautauqua county	Western	758 728	1913 1915	100,000 00	89,252 25	92,074 25	77,666 23

* Cancelled and relet to the Savage Construction Co.
† Cancelled, work being completed under the direction of Superintendent of Public Works.

Construction of the Barge Canal

Chapter 147, Laws of 1903; chapter 391, Laws of 1909; and amendatory laws

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1919
Walter S. Rae	April 15, 1918	Contract No. 117, Oswego canal — Bridge over lock No. 2, Fulton	Middle	$34,713 30	$36,513 80	$11,570 00
Peckham Construction Co., Inc.	April 18, 1918	Contract No. 146, Erie canal — Movable dam at Herkimer	Eastern	81,726 20	93,769 40	51,800 00
Lathrop, Shea & Henwood Co.	Sept. 10, 1917	Contract No. 147, Erie canal — Lift-bridge between Tonawanda and North Tonawanda	Western	227,032 80	234,260 40	78,170 00
Lathrop, Shea & Henwood Co.	Sept. 5, 1917	Contract No. 148, Erie canal — Highway bridge at Leach street, Lyons	Western	65,810 60	66,986 20	56,440 00
Lathrop, Shea & Henwwod Co.	Oct. 30, 1917	Contract No. 164, Erie canal — Completing canal between Lyons and Newark and retaining dam at Macedon	Western	124,313 00	115,728 75	104,680 00
Walter S. Rae	Oct. 13, 1917	Contract No. 167, Oswego canal — Bascule bridge at Culvert street, Phoenix	Middle	26,653 60	29,689 30	18,460 00
Bronk & Kimmey	July 29, 1918	Contract No. 168, Champlain canal — Concrete-capped, timber guide-cribs near locks Nos. 3, 5 and 6	Eastern	63,505 60	85,727 40	67,240 00
I. M. Ludington's Sons, Inc.	Nov. 9, 1917	Contract No. 179, Erie canal — Completing the canal at railroad crossings near Pittsford	Western	76,033 50	92,992 20	89,220 00
E. Brown Baker	Aug. 30, 1918	Contract No. 182, Oswego canal — Completing excavation in front of dockwall below lock No. 8, Oswego	Middle	28,215 00	30,267 00	26,660 00
Robert Wetherill, Receiver, American Pipe & Construction Co.	June 24, 1918	Contract No. 185, Erie canal — Improving river channel below dams at Scotia and Rotterdam	Eastern	230,550 00	176,175 00	148,170 00
Scott Brothers	Aug. 20, 1918	Contract No. 187, Erie canal — Wash wall protection between New London and lock No. 22	Middle	17,525 00	22,530 00	15,470 00
E. Brown Baker	Aug. 7, 1918	Contract No. 188, Erie canal — Completing canal prism excavation at N. Y. C. R. R. bridge, Brewerton	Middle	30,000 00	35,400 00	30,260 00
Empire Engineering Co., Inc.	Mar. 20, 1919	Contract No. 190, Erie canal — Completing canal from King's Bend to L. V. R. R. crossing at Rochester	Western	284,752 50	249,679 00	65,230 00

TABLE OF CONTRACTS PENDING JUNE 30, 1919 — (*Continued*)

Construction of the Barge Canal — (Continued)

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1919
Empire Engineering Co., Inc.	Jan. 14, 1919	Contract No. 191, Erie canal — Excavating canal channel in Genesee river near Elmwood avenue bridge	Western	$189,850 00	$176,170 00	$7,360 00
Brown & Lowe Co.	Jan. 22, 1919	Contract No. 192, Erie canal — Completing canal, east guard-lock to Genesee river, and work in Genesee Valley park	Western	327,525 00	428,860 00	133,840 00
Stewart Bros.	Feb. 27, 1919	Contract No. 197, Erie canal — Drilling holes in dam and lock near Rotterdam and making repairs	Eastern	27,170 00	27,780 00	8,190 00
Lupfer & Remick	Feb. 26, 1919	Contract No. 200, Erie canal — Driving sheet-piling, placing concrete lining, etc., between Rochester and Lockport	Western	257,992 50	180,248 50	112,540 00
I. M. Ludington's Sons, Inc.	Mar. 13, 1919	Contract No. 201, Erie Canal — Completing prism lining, Cartersville, and stream entrance Knapp's bridge	Western	48,455 25	42,824 75	46,460 00
W. F. Martens	Mar. 3, 1919	Contract Q, Cayuga and Seneca canal — Pile dolphins, Cayuga and Seneca lakes	Middle	5,225 00	5,092 00	5,090 00
Kennedy & Scullen Construction Company, Inc.	Jan. 20, 1919	Contract T, Cayuga and Seneca canal — Extending core wall and other work at north end of dam No. 2, Seneca Falls	Middle	22,964 00	22,300 50	5,480 00
		Being Completed under chapter 585, Laws of 1918				
McArthur Bros. Co.	Nov. 3, 1916	Contract No. 59, Erie canal — Constructing canal between contracts Nos. 21-A and 23-A at Genesee river, and Rochester harbor	Western	1,675,252 86	1,603,285 11	1,494,972 00
Combined Construction Co.	April 19, 1917	Contract No. 138, Erie canal — Movable dam, etc., at Rochester	Western	302,700 30	321,115 12	471,893 00

Special Work Connected with Barge Canal Construction

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1919
Superintendent of Public Works		Erie canal — Completing contract No. 63-A, west line of Wayne county to King's Bend	Western			$672,869 00

TABLE OF CONTRACTS PENDING JUNE 30, 1919 — *(Concluded)*

Construction of Barge Canal Terminals

Chapter 746, Laws of 1911, and amendatory laws

CONTRACTOR	Date of contract	Character of work	Division	Engineer's preliminary estimate	Contract price as modified by alterations	Value of work done to June 30, 1919
Barrally & Ingersoll	Feb. 15, 1915	Terminal contract No. 28 — Harbor, dockwall and breakwaters on Oneida lake at Cleveland	Middle	$34,575 00	$37,222 00	$35,120 00
I. J. Stander & Co	Oct. 27, 1917	Terminal contract No. 38 — Constructing pier at West 53d street, North river, New York city	Eastern	259,000 00	265,550 39	214,390 00
Great Eastern Storage, Transfer & Wrecking Corp	Nov. 29, 1918	Terminal contract No. 41 — Razing buildings and grading upper Troy terminal	Eastern	—1,500 00	—1,000 00	....
Leonard Paving Co., Inc	Nov. 13, 1918	Terminal contract No. 42 — Paving terminal at Long Island City	Eastern	54,600 00	53,579 00	1,370 00
Asphalt Construction Co	May 13, 1919	Terminal contract No. 44-P — Paving at Mott Haven, Greenpoint and Gowanus bay terminals	Eastern	94,340 00	78,201 20	22,070 00
Sicilian Asphalt Paving Co	June 13, 1919	Terminal contract No. 52-P — Paving Pier 6, East river, New York city	Eastern	10,000 00	11,225 00	....
Riverside Contracting Co	Sept. 4, 1917	Terminal contract No. 55 — Terminal at Gowanus bay, Brooklyn	Eastern	513,000 00	507,620 40	260,080 00
Chas. Kiehm	Feb. 25, 1919	Terminal contract No. 57 — Parts of an approach to terminal at Rochester	Western	133,003 35	120,597 61	44,820 00
C. P. Boland & Co	Dec. 2, 1918	Terminal contract No. 58 — Improving lower terminal site at Troy	Eastern	16,600 00	19,400 00	7,260 00
Walsh Construction Co	May 15, 1918	Terminal contract No. 61 — Railroad approach to pier 1, Erie basin, Buffalo	Western	9,720 00	11,650 00	10,430 00
Walsh Construction Co	May 15, 1918	Terminal contract No. 62 — Railroad and crane tracks on pier 1, Erie basin, Buffalo	Western	8,470 00	11,400 00	9,420 00
Empire Engineering Co., Inc	June 29, 1918	Terminal contract No. 66 — Riprap at Erie basin, Buffalo	Western	11,850 00	12,820 00	11,400 00
Walsh Construction Co	July 3, 1918	Terminal contract No. 67 — Railroad approach to pier 2, Erie basin, Buffalo	Western	7,000 00	7,616 00	7,160 00
Walsh Construction Co	July 3, 1918	Terminal contract No. 68 — Railroad track on pier 2, Erie basin, Buffalo	Western	6,820 00	7,445 00	4,630 00
Richard C. Bush	Feb. 27, 1919	Terminal contract No. 69 — Shore protection, Erie basin, Buffalo	Western	6,780 00	5,886 00	2,140 00
Geo. W. Chambers	April 9, 1919	Terminal contract No. 70 — Razing buildings and clearing State lands at Rochester	Western	—1,600 00	—4,267 00	....
New Jersey Shipbuilding & Dredging Co	May 13, 1919	Terminal contract No. 77 — Dredging at Piers 5 and 6, East river, at Greenpoint and at Long Island City	Eastern	40,325 00	42,895 00	6,770 00

Edward F. Terry Mfg. Co.	Jan. 21, 1919	Terminal contract No. 102 — Two 3-ton jib cranes, Pier 6, East river, New York city	Eastern	45,362 00	41,081 00	....
Brown Portable Conveying Machinery Co.	Oct. 3, 1917	Terminal contract No. 103-A — Two package-freight conveyors	Eastern	7,800 00	10,102 60	8,110 00
Lord Electric Co.	June 28, 1918	Terminal contract No. 105 — Installing electric wiring, lighting, power and battery-charging equipment, and auto-truck scales, Pier 6, East river, New York city	Eastern	17,742 40	16,000 50	8,370 00
J. Livingston Co.	Mar. 4, 1919	Terminal contract No. 107 — Electric lighting, power and battery-charging equipment, Erie basin, Buffalo	Western	35,025 00	28,238 50	....
General Electric Co.	Aug. 2, 1918	Terminal contract No. 109 — Electric capstans and trolley hoists at Pier 6, East river, and West 53 St., New York city, and electric capstan at Utica terminal	Middle and Eastern	19,000 00	18,536 00	1,170 00
General Electric Co.	June 9, 1919	Terminal contract No. 113 — Electric capstans and trolley hoists at various terminals	....	15,000 00	14,090 00	....
Electric Products Co.	June 20, 1919	Terminal contract No. 117 — Battery-charging and motor-generator sets for New York city terminals	Eastern	7,800 00	5,292 52	....
I. J. Stander & Co., Inc.	Jan. 11, 1918	Terminal contract No. 207 — Terminal freight-shed and head-house on Pier 6, East river, New York city	Eastern	133,500 00	128,250 01	113,390 00
Miller & Brady, Inc.	Mar. 22, 1918	Terminal contract No. 207-H — Heating system in freight shed on Pier 6, East river, New York city	Eastern	3,250 00	2,352 00	1,170 00
Jarcho Bros., Inc.	April 16, 1918	Terminal contract No. 207-P — Plumbing and water-supply system in freight-shed on Pier 6, East river, New York city	Eastern	6,000 00	6,650 00	5,190 00
Felton Construction Corp.	Nov. 14, 1918	Terminal contract No. 212 — Freight-house, Pier 1, Erie basin, Buffalo	Western	175,000 00	181,669 00	15,510 00
A. E. Norton, Inc.	Oct. 23, 1918	Terminal contract No. 217 — Repairing bulkhead and constructing freight-house at Long Island City	Eastern	59,850 00	74,806 50	48,860 00
P. Altman Plumbing Co.	May 29, 1919	Terminal contract No. 217-P — Plumbing and water-supply systems, Long Island City terminal	Eastern	4,000 00	3,765 00	1,390 00
Donnell-Zane Co., Inc.	May 13, 1919	Terminal contract No. 218 — Freight-shed at West 53d street, New York city	Eastern	53,969 15	46,549 20	....
Post & McCord	Mar. 20, 1919	Terminal contract No. 223 — Freight-shed at Greenpoint terminal	Eastern	99,710 00	75,718 94	....
J. A. Laporte	April 28, 1919	Terminal contract No. 226 — Freight-house at river terminal, Oswego	Middle	6,000 00	5,199 00	5,030 00
J. A. Laporte	April 28, 1919	Terminal contract No. 227 — Freight-house at Gowanus bay	Eastern	9,750 00	9,189 00	8,000 00
		Being Completed under Chapter 585, *Laws of* 1918				
McHarg-Barton Co.	Nov. 24, 1916	Terminal contract No. 19 — Terminal at Greenpoint	Eastern	193,500 00	211,513 00	282,834 00
Empire Engineering Co., Inc.	Jan. 12, 1914	Terminal contract No. 21 — Terminal at Erie basin, Buffalo	Western	1,513,925 00	797,772 30	897,875 00
Walsh Construction Co.	Oct. 27, 1916	Terminal contract No. 53 — Terminal at Ohio basin, Buffalo	Western	571,800 00	597,984 00	387,513 00

SUMMARY OF CONSTRUCTION WORK — BARGE CANAL AND TERMINALS

Value of work done under Barge canal and terminal contracts, summarized by years and canals

YEAR*	Barge Canal						Barge canal terminals
	Erie Canal			Champlain canal	Oswego canal	Cayuga and Seneca canal	
	Eastern Division	Middle Division	Western Division				
1905	$36,640	....	$59,190	$71,620	....	....	....
1906	140,860	$52,570	197,840	216,950	$2,230	....	....
1907	553,980	228,820	192,580	658,580	69,010	....	....
1908	1,557,774	580,367	416,290	1,426,159	173,030	....	....
1909	2,325,760	1,530,410	2,012,119	1,281,610	324,060	....	....
1910	1,994,920	1,394,542	3,279,387	1,361,698	529,890	....	....
1911	2,756,161	2,362,223	5,285,424	2,342,781	1,075,556	$432,050	....
1912	2,128,787	1,802,231	6,595,375	1,070,702	1,117,259	517,450	....
1913	2,094,109	1,682,835	5,380,484	1,227,017	1,427,058	865,810	$559,410
1914	2,593,664	2,079,504	2,334,353	2,039,534	1,059,637	1,231,539	1,119,600
1915	2,996,147	1,146,418	476,377	1,240,491	552,925	1,365,450	1,009,173
1916	1,312,713	250,385	412,226	406,928	177,856	412,492	452,935
1917	1,277,160	580,240	1,179,508	573,694	56,340	167,091	970,633
1918	412,967	385,468	2,673,153	254,523	60,519	142,931	1,038,868
1919	323,488	100,607	3,450,346	216,266	121,037	178,215	1,688,852
Totals	$22,505,130	$14,176,614	$33,944,652	$14,388,553	$6,746,397	$5,313,028	$6,839,471

Extra Work Orders Paid

YEAR*	Eastern Division	Middle Division	Western Division	Champlain canal	Oswego canal	Cayuga and Seneca canal	Barge canal terminals
1906	$1,316	....	....	....	....	....	....
1907	378	$1,257	....	....	....	....	....
1908	13,020	50	$300	$59,738	$1,198	....	....
1909	37,141	329	10,464	23,854	761	....	....
1910	12,896	12,389	10,692	16	....	....	....
1911	22,102	3,353	175,505	1,001	2,135	....	....
1912	34,957	2,899	94,935	14,524	1,703	....	....
1913	76,860	11,101	203,577	34,810	8,415	$2,065	....
1914	12,969	17,878	239,744	30,718	15,719	9,534	$2,033

1915	19,731	11,434	20,954	11,094	4,130	2,926	10,437
1916	8,728	10,355	436	290	276	66,709	14,134
1917	12,699	3,714	8,893	1,844	10,217	8,845	9,995
1918	123,585	13,163	142,096	11,376	739	9,796	24,725
1919	45,967	1,831	130,285	3,595	....	221	15,117
Totals	$422,349	$89,753	$1,037,881	$192,860	$45,293	$100,096	$76,441

* The years 1905 to 1915, inclusive, are twelve-month periods, ended September 30; 1916 is a nine-month period, ended June 30; 1917, 1918 and 1919 are twelve-month periods, ended June 30.

NOTE.— This table includes work done under the supervision of this Department, excepting highways which were relocated or rebuilt; also the following items: Contract No. 20-D, work done by the Superintendent of Public Works, $3,400; contract No. 20-D, special agreement, $64,816; contract No. 21-A, special agreement for erecting steel and machinery on guard-lock, $4,874; contract No. 22, special agreement, $12,447; contract No. 25, special agreement, $6,029; contract No. 47-A, work done by Superintendent of Public Works, $917,880; culvert No. 30, at crossing of Irondequoit creek, $372,549; shelter at Delta dam, $2,234; and contract No. 63-A, work done by the Superintendent of Public Works, $672,869.

REPORT

OF THE

DIVISION ENGINEER

OF THE

EASTERN DIVISION

For the Fiscal Year Ended June 30, 1919

EASTERN DIVISION

STATE OF NEW YORK

DEPARTMENT OF STATE ENGINEER AND SURVEYOR

EASTERN DIVISION

ALBANY, N. Y., *July* 1, 1919.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor. Albany, N. Y.:*

Sir.— I have the honor of submitting the following report of the work of the Eastern Division for the fiscal year ended June 30, 1919.

Mr. George D. Williams, Division Engineer, has been in military service during this period. For the period from July 1 to December 31, 1918, Mr. L. C. Hulburd, Senior Assistant Engineer, was in charge, and from January 1, 1919, to date the undersigned has had the honor of directing the work of the Division.

BARGE CANAL AND TERMINALS

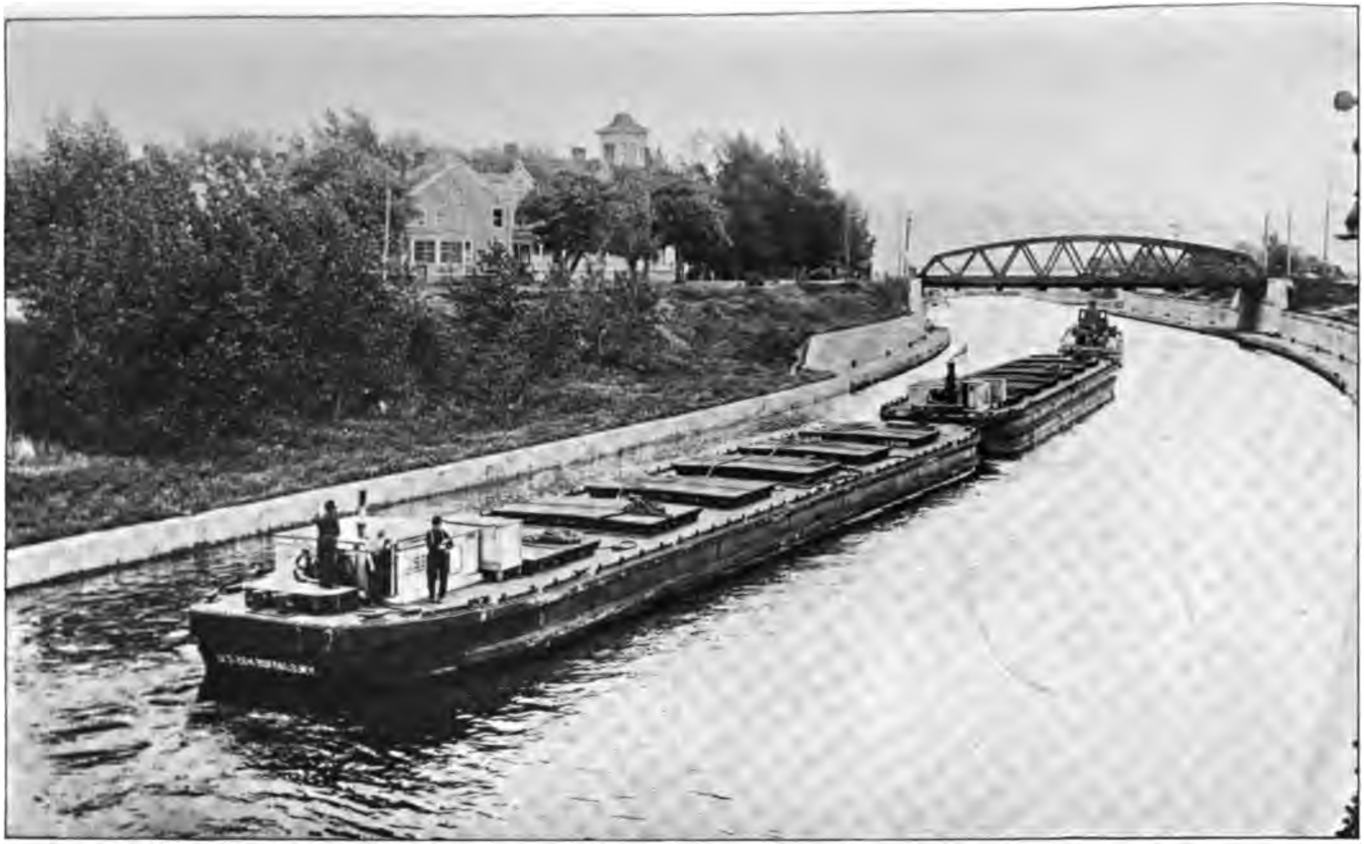
Construction work on the Barge canal on this Division has been confined to such contracts as would perfect the canal and make its operation more satisfactory, and also to such work as would correct some conditions that have developed since the canal was put into use. In doing this work the canal has been made safer in operation. For example, a new movable dam has been under construction at Herkimer to replace a needle dam, and at three places in the Champlain canal where cross currents existed in the channel, guide cribs have been placed, to aid boats in keeping the channel.

A considerable portion of the work has been such as would naturally be necessary to maintain so large a plant as is the Barge canal. This has consisted in strengthening some few structures, in removing bars, such as must annually be found in the channel,

particularly at points where live streams carry into the canal large amounts of sand, gravel and other material, in adding to and repairing riprap and wash walls and in giving close attention to repairs to structures and operating machinery. The work of maintenance is under the direction of the Superintendent of Public Works, but in this work this Department has had an active part by furnishing the engineers to care for the engineering features of the work and frequently to advise as to extent and methods. Hearty and sympathetic coöperation between the two departments on this Division has resulted in securing most satisfactory results in the maintenance work. It should be noted that with an apparently considerable increase in traffic through the canals on this Division there has been very little complaint on the part of boatmen of difficulties or obstacles to navigating their boats and fleets.

With the completion of new construction on the canals on this Division the problems will continue to be those already met in maintaining these canals. The plan of coöperation between the Department of Public Works and this Department, already referred to, can be productive of the greatest efficiency if properly organized engineering parties are maintained to keep in touch with the conditions of the canals and to be ready to perform the work of aiding in the correction of any defects that may develop from either ordinary or unusual conditions. In this connection I would respectfully suggest that provision should soon be made for securing some well equipped sweep-boats. With these, obstructions in the channel can be more readily discovered and danger of damages to boats be materially lessened.

Work on the terminals for the Barge canal has been confined on this Division mostly to that on the terminals at New York, although work has also been done during the year to terminals at Troy, Amsterdam, Little Falls, Herkimer and Canajoharie. Warehouses of steel and tile construction have been built at Albany and Whitehall. The work at New York has been quite extensive, as will be noted in the report of the Senior Assistant Engineer in charge of the work. A feature of all work at the terminals has been the installation of various types of freight-handling equipment.



Fleet of Modern Steel Canal Barges

Most of the boats built especially for Barge canal traffic have been of about the size shown here — 150 by 21½ feet, of some 650 tons capacity. Although several scores have been built, the number is lamentably small in view of the possible amount of traffic, if shipping were available.

A Boat Typical of Several on the Canal

A few large industrial corporations have built their own boats and are operating them on the Barge canal. This boat and several more like it belong to a well-known oil company.

A Boat Typical of Several on the Canal

A few large industrial corporations have built their own boats and are operating them on the Barge canal. This boat and several more like it belong to a well-known oil company.

Navy Coal Barges on the Canal

The Barge canal is very frequently used for transporting boats built at inland shipyards and intended for ocean or harbor service.

Barge Canal Terminal at Albany
The warehouse, a large and substantial concrete structure, was recently completed.

Lower Terminal at Troy
View when a large number of canal-boats were lying at the dock.

A Lockage of Old-sized Canal-boats

Six of these boats and a small tug may be locked through at a single lockage. Not many old boats were available when the new canal was completed and their number is steadily diminishing. The new boats are of larger size.

In general the work has progressed very satisfactorily, except in a few cases. Existing conditions in the labor and materials markets have seriously handicapped some of the work. It should be said, however, that most of the contractors have made all reasonable efforts to progress their work and that such delays as may have occurred were largely beyond their control.

MISCELLANEOUS WORK

In addition to construction and maintenance work on the canals and terminals this Division has made many investigations of claims for alleged damages; has investigated and reported on applications for reconveyances of lands; has prepared maps for lands no longer required for canal purposes, and has prepared maps for the appropriations of additional lands where construction work made such appropriations necessary.

SPECIAL APPROPRIATIONS

In addition to the canal improvement this Department has been employed in preparing plans and supervising contracts for work provided under special acts of the Legislature and in making miscellaneous surveys, maps, plans, etc., for other State departments. A brief outline of such activities follows:

SURVEYS

Blue Line Surveys

(Chapter 119, Laws of 1910, and amendatory laws)

The work of surveying and mapping old canal lands has been continued. Surveys for the Champlain canal are now complete except for the Glens Falls feeder and that portion between Waterford and the junction with the Erie at Colonie. These sections are to be retained for use as parts of the new canal system.

On the Erie canal surveys are now complete from the easterly end of the canal to Fort Hunter, except the portion between lock No. 1 and the junction with the Champlain canal at Colonie. Surveys from Fultonville to Randall, from Sprakers to Mindenville and through the city of Little Falls are also complete. Surveys are under way between Fort Hunter and Fultonville, Randall and Sprakers, and Mindenville and Little Falls. The plotting

of the maps is well up with the survey work. It is expected that this work, and that between Little Falls and Mohawk will be completed by October 31, 1919.

Terminals Survey

(Chapter 555, Laws of 1918)

Under this act a survey was made of the site at Poughkeepsie, on which it is proposed to locate a Barge canal terminal.

Delaware–Schoharie County Line Survey

(Chapter 559, Laws of 1918)

This act provided for the survey of that portion of the boundary line between the counties of Delaware and Schoharie that is between Schoharie creek and Lake Utsayantha. This line was surveyed and properly monumented during the summer of 1918, as reported in a special report.

Boundary Line Survey between Towns of Warrensburg and Luzerne, Warren County, and between Warren and Saratoga Counties

(Chapter 561, Laws of 1918)

Under this act the line between the towns of Luzerne and Warrensburg in Warren county and the line between the counties of Saratoga and Warren was to be surveyed and monumented. The appropriation for this work was not sufficient for making the survey of the whole line, but the portion which was most desired to be located, that between Fort George at Lake George and the Hudson, was completed and monumented. A special report of this survey was also made.

Greene–Ulster County Line Survey

(Chapter 562, Laws of 1918; chapter 600, Laws of 1919)

These acts provided for the location of a portion of the boundary line between the counties of Greene and Ulster. This work was started in 1918, but, in order to determine the proper location of that portion of the line specified in the acts, it became necessary to survey a much longer line and the work had to be continued in 1919. This survey has now been completed and the portion defined in the acts has been properly monumented, as will be noted in a special report.

Miscellaneous

A survey was made under chapter 317, Laws of 1917, of a proposed route for the Jamaica Bay–Peconic Bay canal through Far Rockaway.

An extensive survey for a proposed exterior belt line was made for the New York–New Jersey Port and Harbor Development Commission.

Under various acts of the Legislature surveys have been made by parties of this Division at the new prison, Wingdale, at Craig Colony hospital, Sonyea, at Kings Park hospital, L. I., at St. Lawrence hospital, Ogdensburg, and for a proposed improvement of Mills river, L. I.

Surveys of lands under water were made at New York city and at several points in its immediate vicinity, also at Troy, Poughkeepsie and Tarrytown.

State Boundary

The boundary line between the states of New York and New Jersey was examined and the condition of the various monuments on the line noted.

Stream Gages

For the use of the Court of Claims numerous stream gages have been set at various points. One of special value is the gage placed on the Nine-Mile creek feeder.

CONSTRUCTION WORK

Removal of High Street Bridge, Cohoes

(Chapter 181, Laws of 1917; chapter 151, Laws of 1918)

Under these acts the bridge at High street, Cohoes, which crossed the abandoned portion of the Erie canal at this point, was removed, the canal filled in and the approaches properly regraded.

Roadway at Rockaway Point, L. I.

(Chapter 130, Laws of 1917)

A concrete road was built under this act at Rockaway Point.

Repairing Sea-walls, Orient–East Marion, L. I.

(Chapter 428, Laws of 1918)

Under this act repairs were made to the sea-walls between the villages of Orient and East Marion, L. I.

Repairing Landing Piers, Hoffman and Swinburne Islands

Repairs were made to the landing piers at Hoffman island and at Swinburne island.

Schenectady–Scotia Bridge

(Chapter 735, Laws of 1917; chapter 624, Laws of 1919)

Under these acts parties have located on the ground, the center line of the bridge, have surveyed for the approaches at the Schenectady and Scotia ends and for the lands to be appropriated and have made extensive soundings and test pits.

In conclusion I would like to take this opportunity of expressing my appreciation for the assistance and advice which you and your deputies have given me, and also to state that I appreciate the hearty response made by the men on this Division to any tasks assigned to them. I believe that they have all been faithful and efficient.

Detail reports by those who have been in charge of the residencies into which the Division is divided, together with tabulations showing financial statements and disbursements are appended. In these reports will be found descriptions of the various pieces of work done during the year.

Respectfully submitted,

RUSSELL S. GREENMAN,
Senior Assistant Engineer in Charge.

APPENDED REPORTS—EASTERN DIVISION

ERIE CANAL, RESIDENCY NO. 1

Assistant Engineer in charge R. D. Hayes reports:

This residency extends from Albany to the site of the old lower Mohawk aqueduct. The work has been directed from the Mechanicville office.

During the year several claims were investigated and reports made to the Division office.

Reports on contract No. 91 and terminal contracts Nos. 36, 41 and 58 and a part of terminal contracts Nos. 101, 106 and 201 and on the removal of High street bridge, Cohoes, follow.

Contract No. 91

This contract is for building and equipping a hydro-electric power-plant on the Erie canal near the east end of Crescent dam. It was awarded to Welles-Boughton & Co., being signed on January 5, 1911. It was assigned to the Hollington Company, this assignment being approved by the Superintendent of Public Works July 31, 1911. Construction work began April 3, 1911. The engineer's preliminary estimate was $44,600.00, the contractor's bid, $42,940.50. The contract price as modified by alteration No. 1 is $44,985.50. The work was accepted December 27, 1918, and the final account, amounting to $40,458.32,* was approved by the Canal Board December 27, 1918.

No work was done during the year.

Terminal Contract No. 101

This contract is for furnishing and installing steel stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. It was awarded to E. Brown Baker, being signed on December 18, 1916. On February 21, 1917, it was assigned to the Mohawk Dredge and Dock Co., Inc., and this assignment was approved by the Superintendent of Public Works March 26, 1917. The engineer's preliminary estimate was $21,890.90,

* The sum of $3,292 has been deducted to cover actual cost to the State of providing for a new governor equipment under contract No. 91-A.

the contractor's bid, $31,790.90. Excess metal to the value of $6,510 has been authorized by the Canal Board. The work was accepted December 4, 1918, and the final account, amounting to $36,611.92, was approved by the Canal Board December 27, 1918. The amount paid on extra work orders during the year was $2,966.-03, total to date, the same.

One of these derricks has been installed at Albany, the final account for which amounted to $6,124.56.

W. L. Caler, Assistant Engineer, was in charge.

Terminal Contract No. 201 — *Albany*

This contract is for constructing terminal warehouses at Albany and Whitehall. It was awarded to J. A. Laporte, being signed on January 2, 1917. The engineer's preliminary estimate was $59,-300.00, the contractor's bid, $65,174.85. The contract price as modified by alteration No. 1 is $71,432.30. Construction work began at Albany on April 3, 1917. The engineer's preliminary estimate for this warehouse was $36,500.00, the contractor's bid, $40,106.50.

W. L. Caler, Assistant Engineer, is in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 17, 1918. The cancelation became effective August 31, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 31, 1918, was $42,790.16 and payment of balance due on this amount was authorized by the Canal Board on February 26, 1919. No work was done prior to April 7, 1917.

The contractor has completed the work and the total payments to date, including extra work orders, are $54,234.39.

At the Albany warehouse during the year the paving of the depressed roadway and around the warehouse was completed. The railroad siding was built. The side walls were completed and are being stuccoed. The roof was placed by October. The chimney was finished. The partitions were put in, the metal ceiling was built over the second floor and the stairs and railing around the stair well were placed. The skylights, the entrance doors, windows and the doors in both the warehouse and the office were placed, and

the copper roof was put on the marquise. Throughout the building, in both warehouse and office portions, the plumbing was completed except fixtures and also the wiring except the fixtures.

Terminal Contract No. 106

This contract is for furnishing fourteen two-ton steam tractor cranes for terminals. It was awarded to John F. Byers Machine Co., being signed on February 14, 1918. The engineer's preliminary estimate was $73,500.00, or $5,250 per crane, the contractor's bid, $73,710.00, or $5,265 per crane. The contract price as modified by alteration No. 1 is $77,210.00, or $5,515 per crane. The value of work done during the year is $37,080. The work was accepted September 24, 1918, and the final account, amounting to $77,210.00, was approved by the Canal Board October 9, 1918.

C. A. Curtis, Assistant Engineer, was in charge.

One of these cranes was delivered at the Troy lower terminal in June, 1918. The official tests were made during the past year. The final account for the work at Troy amounted to $5,515.00.

Terminal Contract No. 58 — *Troy, Lower Terminal*

This contract is for improving the lower terminal site at Troy. It was awarded to C. P. Boland & Co., signed on December 2, 1918. Construction work began May 20, 1919. The engineer's preliminary estimate was $16,600.00, the contractor's bid, $19,400.00. The value of work done during the year is $7,260, total done to date, the same.

W. L. Caler, Assistant Engineer, is in charge.

During the year the excavation for the warehouse extension piers, the macadam and the brick pavements was made, the four-inch tile drain laid, the six-inch concrete edging completed, all track in stone ballast laid, and the six-inch base for the brick pavement and the bottom course for the macadam roadway placed. The warehouse extension has been practically finished.

Terminal Contract No. 41 — *Troy, Upper Terminal*

This contract is for razing the buildings and grading the upper terminal site at Troy. It was awarded to Great Eastern Storage, Transfer & Wrecking Corporation, being signed on November 29,

1918. Construction work began January 23, 1919. The engineer's preliminary estimate was that the contractor should pay the State $1,500.00, the contractor bid that he would pay the State, $1,000.

W. L. Caler, Assistant Engineer, is in charge.

All buildings, with the exception of Nos. 6 and 16, have been razed. Material obtained from outside sources was used to fill in forebay under building No. 15. Material is now being placed along the street to form the slope at the north end of the site. No excavation has been made at the site.

Terminal Contract No. 36 — Cohoes

This contract is for constructing a terminal at Cohoes. It was awarded to the Troy Public Works Co., being signed on March 27, 1917. The engineer's preliminary estimate was $61,000.00, the contractor's bid, $57,600.00.

F. W. Harris, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective October 9, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to October 9, 1918, was $30,611.23 and payment of balance due on this amount was authorized by the Canal Board on December 27, 1918. No work done prior to April 7, 1917.

This contract has been completed and the total payments, including extra work orders, was $30,611.23.

The work originally contemplated under this contract is to be completed under a new contract, No. 36-A.

Removal of High Street Bridge, Cohoes

(Chapter 181, Laws of 1917; chapter 151, Laws of 1918)

This contract is for the elimination of the High street bridge at Cohoes and the substitution of earthen embankments, together with the widening of Sandusky street and other incidental work. It was awarded to Michael Fitzgerald, being signed on September 9, 1918. Construction work began about September 10, 1918. The engineer's preliminary estimate was $13,000.00, the contractor's bid, $11,511.50.

C. A. Curtis, Assistant Engineer, is in charge.

Embankment was made by wheel scraper outfits, two of which were used. Work was continued until December, when a steam air-compressor plant was set up and the various concrete and masonry walls were demolished. Embankment work was resumed in the spring of 1919 and practically finished by June 30, 1919. In cutting down the old bridge an acetylene torch was used. Part of this structure was sold to the city and the balance as junk.

ERIE CANAL, MOHAWK RIVER RESIDENCY

Assistant Engineer M. E. James reports:

When, on June 1, 1919, the residency office at Little Falls, on residency No. 4, was closed, the Mohawk River residency was extended on the west from Mindenville lock, No. 16, to the Herkimer–Oneida county line. The Mohawk River residency, in addition to the extent originally assigned to it, now has jurisdiction over all work formerly under Erie residencies Nos. 2, 3 and 4. It extends now from Crescent dam to the Herkimer–Oneida county line, a distance of 96 miles.

E. A. Lamb, Senior Assistant Engineer, was in charge of residency No. 4 during the fiscal year up to June 1, 1919, and his report is incorporated herewith.

The engineering forces on this residency, in addition to looking after construction work, have devoted a portion of their time to the engineering work necessary in connection with the locating of buoys for navigation, in sweeping the navigation channel, in investigating and reporting on claims and complaints arising in connection with the construction and operation of the Barge canal and in making investigations and reports in connection with the release of appropriated lands which, in whole or in part, are no longer needed for the use of the canals, and also investigations and reports in connection with repairs and maintenance of the canal.

Reports on contracts Nos. 20-D (extra work order), 29-A, 122-A, 146, 155 (extra work order), 180, 181, 185 and 197, terminal contracts Nos. 8-P, 10-P, 12-F, 27-P, 37, 64, 214, 221 and 222, also the portions of terminal contracts Nos. 101, 103-A and 106 within this residency, follow:

Contract No. 20-D

This contract, which was for dredging a channel in the Mohawk river from Yosts to Rexford, was completed and final estimate approved prior to the time of this report, but an extra work order under this contract had not been finished. The amount paid on extra work order during the year is $44,998.94, total to date, $197,228.40.

William M. Griffith, Junior Assistant Engineer, was in charge of this work.

An extra work order dated January 15, 1917, provides for the construction of a coffer-dam around the north span of dam No. 5, at Rotterdam, and making repairs to this dam. The final account, amounting to $132,003.20, was approved by the Canal Board April 2, 1919. Since one of the largest items in this amount was the cost of the steel sheet-piling purchased but subsequently used elsewhere, the cost of the work would be materially reduced by making a reasonable credit for this item.

Under this work order the American Pipe and Construction Co. drilled in the north span of the dam 62 eight-inch holes with a well-drill and 45 three-inch holes with the steam-drill, for the purpose of exploring the condition of the foundation beneath the sill and for filling such voids as might be found. Through these holes a total of more than 200 yards of concrete, grout and gravel were deposited under the sill of the dam. During August four clusters of piles were driven at the lower entrance to the lock, No. 9, as an aid to navigation. An open hole was dug back of the land wall of the lock to investigate the cause of a settlement in the paving and any possible leakage or current of water under the land wall, but nothing was discovered.

During September and October the plant was removed from inside the coffer-dam, the dam gates were lowered and during November the removal of the coffer-dam above the north span was begun by a dipper-dredge. The steel sheet-piling and timber were stored back of the lock wall. On December 6 the closing of the river by ice necessitated the removal of the dipper-dredge to a winter harbor and the balance of the coffer-dam was removed by hand after the gates of the dam were raised. All work was completed and the contractor's plant removed from the site of the work during the month of January, 1919.

Contract No. 155

This contract, which was for furnishing and installing seven hoists for the operation of the bulkhead gates in the north end of the Vischer Ferry dam, was completed and final estimate approved prior to the time of this report, but an extra work order under this contract had not been finished. The amount paid on extra work order during the year is $930.36, total to date, the same.

C. B. Tebo, Engineering Assistant, was in charge of this work.

An extra work order dated March 25, 1918, provides for repairing hoists damaged at the time of the spring flood. The final account, amounting to $930.36, was approved by the Canal Board May 21, 1919.

The anchorages of the hoists had been repaired, the gears delivered and all but two, which were found to be defective upon delivery, had been installed prior to July 1, 1918. During September and December, 1918, these gears were repaired and installed, completing the work called for under this work order.

Contract No. 180

This contract was for removing a portion of the aqueduct at Rexford and completing the adjacent canal prism excavation. It was awarded to Dunbar & Sullivan Dredging Co., being signed on March 15, 1918. Construction work began April 17, 1918. The engineer's preliminary estimate was $17,840.00, the contractor's bid, $15,958.00. The work was accepted December 18, 1918, and the final account, amounting to $16,153.54, was approved by the Canal Board December 18, 1918.

M. J. Quinn, Junior Assistant Engineer, was in charge.

This work was completed prior to July 1, 1918, the final estimate being prepared during the current year.

Contract No. 185

This contract is for improving the river channel below dams at Scotia and Rotterdam. It was awarded to Robert Wetherill, Receiver, American Pipe and Construction Co., being signed on June 24, 1918. Construction work began July 22, 1918. The engineer's preliminary estimate was $230,550.00, the contractor's bid, $154,395.00. The contract price as modified by alteration

No. 1 is $176,175.00. The value of work done during the year is $148,170.00, total done to date, the same.

M. J. Quinn, Junior Assistant Engineer, was in charge until January 1, 1919. Since that time A. P. Mussi, Assistant Engineer, has been in charge.

Alteration No. 1, approved by the Canal Board May 7, 1919, provides for widening the river channel on the south side between Stas. 1625 and 1648 below the dam at Rotterdam. It increases the contract price by $21,780.00.

The hydraulic dredge *Mohawk,* belonging to the American Pipe and Construction Co., arrived at Schenectady on July 6, 1918, was set up and began excavating in the main channel below dam No. 4 at Scotia on July 22, spoiling the excavated material in the old Erie canal. After completing the excavation of refill in the main channel south of the island, the dredge moved into the north channel below the dam and started to deepen and widen the channel around the north side of the island. This excavated material was spoiled in the bed of the old canal, on the island and on the Cramer parcel on the north bank below the dam. The excavation below dam No. 4 was completed about the middle of October and the dredge moved to below dam No. 5 at Rotterdam, where excavation was started October 17, the excavated material being placed in the spoil-bank along the south bank below the dam. The closing of the river by ice on December 6 compelled the removal of the dredge to winter harbor before completing the excavation at dam No. 5. Before the beginning of work in the spring of 1919 alteration No. 1 was executed; this extends the limit of the excavation downstream in order to widen the channel below dam No. 5 and remove a portion of the gravel bar which contracts the channel at that point.

A derrick was set up on the island below dam No. 4 in October, 1918, and first-class riprap stone was delivered. The placing of this riprap on the upper point of the island was completed during November and the plant removed.

To July 1, 1919, the monthly estimates on this contract amounted to 288,851 cu. yds. of excavation and 1,155 cu. yds. of first-class riprap.

The contract work was completed June 20, 1919, and the final estimate is being prepared.

Contract No. 197

This contract is for drilling holes in the sill of the dam and the toe of the river wall of the lock near Rotterdam and making necessary repairs. It was awarded to J. W. Holler, being signed on January 27, 1919. On January 28, 1919, it was assigned to Stewart Brothers and this assignment was approved by the Superintendent of Public Works February 25, 1919. Construction work began on January 29, 1919. The engineer's preliminary estimate was $27,170.00, the contractor's bid, $27,780.00. The contract price as modified by alteration No. 1 is $27,780.00. The value of work done during the year is $8,190.00, total done to date, $8,190.00.

William M. Griffith, Junior Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board August 6, 1919, eliminates the item "diverting dams" and provides a new item for performing the work in a different manner. The contract price remains the same.

On January 29 the plant was delivered and during February holes were drilled through the foundation of the river wall of the lock, disclosing voids. Holes were drilled also through the sill of the south span of the dam, but no voids were found. Because of difficulty with the boilers used in running the steam-drills, work that could have been performed on the ice was delayed until after the ice went out on March 1. In March holes were drilled along the river wall of the lock, disclosing voids of from four to eight feet in depth. Some concrete was deposited through these holes, but work was delayed somewhat by the condition of the river. During the latter half of March, after the Department of Public Works had lowered the gates in the middle span of the dam to allow the contractor to float a scow, it was attempted to drill holes in the middle span with tripod drills, but with poor success. A well-drill replaced the steam-drill and after April 9 the drilling of exploratory holes progressed rapidly. A void of five feet in depth was found under the sill on the south side of the north pier, but no indication of voids was found toward the south pier.

On June 30 the voids under the dam had been filled and the filling of those under the river wall of the lock was nearly completed.

Contract No. 181

This contract is for repairing and water-proofing the existing concrete lining and placing new concrete lining in the canal at Little Falls. It was awarded to Law Brothers, being signed on December 28, 1917. The engineer's preliminary estimate was $46,624.00, the contractor's bid, $54,694.00. The contract price as modified by alteration No. 1 is $48,253.50. The work was accepted March 19, 1919, and the final account, amounting to $48,222.72, was approved by the Canal Board April 16, 1919.

E. F. Dossert, Junior Assistant Engineer, was in charge.

Alteration No. 1, approved by the Canal Board March 19, 1919, eliminates all work on contract items remaining to be done. It decreases the contract price by $6,440.50.

No construction work was done during the year.

Contract No. 122-A

This contract is for constructing the substructure and superstructure, and completing the approaches of a highway bridge over the Mohawk river (Barge canal prism) at about center line Sta. 4246 + 42, near Little Falls. It was awarded to Chesley, Earl & Heimbach, Inc., being signed on March 8, 1917. Construction work began April 21, 1917. The engineer's preliminary estimate was $52,717.00, the contractor's bid, $67,053.10. The contract price as modified by alteration No. 1 is $67,377.00. Excess fourth-class riprap to the value of $315 has been authorized by the Canal Board.

H. W. Jewell, Junior Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on September 10, 1918. The cancelation became effective December 4, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to December 4, 1918, was $81,716.95 and payment of balance due on this amount was authorized by

the Canal Board on February 19, 1919. No work was done prior to April 7, 1917.

This contract has been completed and the total payments, including extra work orders, was $81,716.95.

During the year steelwork was riveted and painted, and bridge floor system, wooden guard-rail and lining on approaches placed. Contract work was practically completed by November 1, 1918.

Contract No. 146

This contract is for constructing a new movable dam to replace dam No. 14, at Herkimer. It was awarded to the Peckham Construction Co., Inc., being signed on April 18, 1918. The engineer's preliminary estimate was $81,726.20, the contractor's bid, $93,769.40. Excess sheeting and bracing to the value of $429.00 has been authorized by the Canal Board. The value of work done during the year is $51,620.00, total done to date, $51,800.

C. G. Ranney, Assistant Engineer, is in charge.

A roadway was constructed from the improved Erie canal to the south side of the new dam site for the transfer of supplies. Some existing riprap protection was removed from the north and south river banks and the work of placing a coffer-dam and working trestle was commenced on the south side of the river.

During June, 1919, the embankment and protection on the north side of the movable dam was completed. The placing of concrete in the north pier was completed, also the top of the south pier and sides partially completed. The south pier could not be completed, owing to the falsework and steel being in the way.

Most of the structural steel for the bridge was delivered during June, 1919. By the end of June the falsework had been placed and the steel for the chords, floor-beams, and part of the diagonals placed and bolted from the south end of the bridge to the fifth panel point.

Contract No. 29-A

This contract is for completing the construction of the canal within the limits of old contract No. 29. It extends from a point one-half mile east of Sterling creek to the Herkimer–Oneida county line. Length, 4.0 miles. It was awarded to the Eastover Construction Co., Inc., being signed on March 27, 1916. Construc-

tion work began in April, 1916. The engineer's preliminary estimate was $162,005.00, the contractor's bid, $185,106.50. The contract price as modified by alterations Nos. 1 to 5, inclusive, is $318,659.70. Excess quantities to the value of $2,039.00 have been authorized by the Canal Board. The amount paid on extra work orders to date is $4,944.60.

C. W. Wilbur, Junior Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective November 13, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to November 13, 1918, was $219,885.17 and payment of balance due on this amount was authorized by the Canal Board on May 21, 1919. The final account for work done prior to April 7, 1917, amounting to $151,613.03, was authorized by the Canal Board on May 7, 1919.

This contract has been completed and the total payments, including extra work orders, was $376,442.80.

During the year approaches to Schuyler bridge were completed, concrete at Harbor bridge placed, wash wall and embankments trimmed and refill at various points, notably at Knapp's brook, removed. Contract work was practically completed by October 10, 1918.

Terminal Contract No. 8-P — *Schenectady*

This contract is for paving the terminal site at Schenectady. It was awarded to James P. Kelley, being signed on April 15, 1918. Construction work began May 6, 1918. The engineer's preliminary estimate was $8,400.00, the contractor's bid, $8,400.00. Excess excavation to the value of $104.00 has been authorized by the Canal Board. The value of work done during the year is $7,187.55. The work was accepted December 18, 1918, and the final account, amounting to $8,187.55, was approved by the Canal Board January 22, 1919. The amount paid on extra work orders during the year is $265.14, total to date, the same.

M. J. Quinn, Junior Assistant Engineer, is in charge.

Types of Boats Using the Canal
At the right, a concrete car-float, being shipped from the Great Lakes for use in New York harbor. At the left, a luxurious private yacht. In the distance, a fleet of freight-boats.

SHIPYARD AT WATERVLIET

This yard is constantly engaged in building boats for Barge canal use. One of these boats is shown here.

AN UNUSUAL CANAL-BOAT

This boat and its companion, the *Idlewild*, although old and never before engaged in canal traffic, were impressed into service for sending a cargo of molasses through the canal.

ANOTHER UNUSUAL CANAL-BOAT

The shortage of available shipping led to the use of this boat and its companion, the *Louisa*, as canal boats. There is an abundance of canal freight, but, until boats are provided, its transportation is deplorably limited.

An extra work order dated November 26, 1918 provides for constructing a manhole and a drainage ditch. The final account, amounting to $265.14, was approved by the Canal Board January 15, 1919.

The construction of the brick pavement under this contract could not be progressed until the track work under terminal contract No. 64 was completed. Hence no work was done during July or August, 1918. During September the brick pavement was constructed and during October and November the macadam pavement at the Fuller street entrance was built and that around the freight-house repaired, which completed the work under the original contract. During December the drainage ditch back of the brick pavement and the manhole over Cowhorn creek were constructed under the extra work order.

All work was completed by December 13, 1918.

Terminal Contract No. 64 — Schenectady

This contract is for constructing railroad and crane tracks on terminal at Schenectady. It was awarded to Robert Wetherill, Receiver, American Pipe & Construction Co., being signed on April 24, 1918. Construction work began May 1, 1918. The engineer's preliminary estimate was $9,000.00, the contractor's bid, $10,021.30. The value of work done during the year is $8,077.44. The work was accepted November 13, 1918, and the final account, amounting to $10,227.44, was approved by the Canal Board December 18, 1918. The amount paid on extra work orders during the year is $795.00, total to date, the same.

M. J. Quinn, Junior Assistant Engineer, was in charge.

An extra work order dated June 4, 1918, provides for making alterations and extensions to the electrical equipment at the Schenectady terminal freight-house. The final account, amounting to $795.00, was approved by the Canal Board December 4, 1918.

During July, 1918, the concrete ramp south of the freight-house was removed and the gap in the dockwall was filled with concrete.

One railroad track was laid and material for the other track was delivered. The rewiring of the freight-house under the extra work order dated June 4 was practically completed. During August the contractors completed the two railroad tracks, including

the turnout at the south end of the terminal, and progressed the laying of the crane rails. The General Electric Company substituted a No. 6 turnout for the No. 8 called for, in order to make connection to their revised layout of tracks.

All work under the original contract was completed during September, 1918, and the work under the extra work order dated June 4 was completed October 18, 1918.

Terminal Contract No. 103-A

This contract is for furnishing, installing and testing two portable package-freight conveyors for Barge canal terminals. One of these has been installed at Schenectady. The contract was awarded to Brown Portable Conveying Machinery Co., being signed on October 3, 1917. The engineer's preliminary estimate was $3,900.00 each, the contractor's bid, $4,100.00 each. The contract price on this residency as modified by alteration No. 1 is $4,-475.80. The value of work done during the year on this residency is $4,100, total done to date, $4,100.00.

F. B. Stoddard, Engineering Assistant, is in charge.

Alteration No. 1, approved by the Canal Board April 16, 1919, provides for furnishing and delivering a portable inclined elevator at Pier 6, New York city, and for changing the carriages of the portable package-freight conveyor. It increases the contract price on this residency by $375.80.

The work done under this contract within the limits of this residency consisted in furnishing, installing and testing a portable package-freight conveyor at the Schenectady terminal. This conveyor arrived October 7, 1918, and was set up and tested by October 12, 1918.

During the first two weeks in June, 1919, the changes called for under alteration No. 1 were made to the conveyor at the Schenectady terminal. To date no estimate has been given on this alteration.

Terminal Contract No. 106

This contract is for furnishing fourteen two-ton steam tractor cranes for Barge canal terminals. It was awarded to the John F. Byers Machine Co., being signed on February 14, 1918. The engineer's preliminary estimate was $5,250.00 per crane, the

contractor's bid, $5,265.00 per crane. The contract price as modified by alteration No. 1 is $5,515.00 per crane. The value of work done on this residency during the year is $5,515.00. The work was accepted September 24, 1918, and the final account, amounting on this residency to $11,030.00, was approved by the Canal Board October 9, 1918.

A. P. Mussi, Assistant Engineer, was in charge.

The Schenectady and Amsterdam terminals are included in the list of terminals in this contract. The crane and housing for the Schenectady terminal was delivered during June, 1918. The crane and housing for the Amsterdam terminal was delivered July 9, 1918, but was found to have a broken casting and a sprocket chain missing. These were later replaced and the tractor crane tested on August 2, 1918.

Terminal Contract No. 214 — *Amsterdam*

This contract is for constructing a frame freight-house and laying pavement at Amsterdam. It was awarded to the Kennedy & Scullen Construction Co., being signed on April 26, 1918. Construction work began May 20, 1918. The engineer's preliminary estimate was $16,478.00, the contractor's bid, $16,323.00. The value of work done during the year is $8,529.00 The work was accepted April 16, 1919, and the final account, amounting to $14,709.00, was approved by the Canal Board April 16, 1919. The amount paid on extra work orders during the year is $335.02, total to date, the same.

A. P. Mussi, Assistant Engineer, was in charge.

An extra work order dated July 22, 1918, provides for removing old and installing new hardware in the easterly freight-house on this terminal. The final account, amounting to $335.02, was approved by the Canal Board March 19, 1919.

The concrete foundation for brick pavement and curbing was progressed during July and August, 1918, and finished early in September. During July the leaching basin was constructed near the east end of the new freight-house and also the carpenter work was practically completed. The roadway and the macadam and brick pavements around the new and old freight-houses were in progress during the summer and completed in October. During October, also, the site was cleaned up.

The electric wiring in the new freight-house was completed and inspected during November, but the contractor was notified to make various changes and this work was not completed until March, 1919.

The work of changing the hardware in the old freight-house under the extra work order dated July 22, 1918, was started the latter part of July and finished during August, 1918.

Terminal Contract No. 12-F — *Amsterdam*

This contract is for constructing a woven wire fence adjacent to the roadway approach to the Amsterdam terminal. It was awarded to the Anchor Post Iron Works, being signed on April 16, 1918. Construction work began in June, 1918. The engineer's preliminary estimate was $1,289.00, the contractor's bid, $1,379.50. The value of work done during the year is $1,355.25. The work was accepted July 9, 1918, and the final account, amounting to $1,355.25, was approved by the Canal Board July 17, 1918.

A. P. Mussi, Assistant Engineer, was in charge.

Construction work on this contract was completed before June 30, 1918.

Terminal Contract No. 10-P — *Fonda*

This contract is for paving the terminal site at Fonda. It was awarded to Patrick W. Mulderry, being signed on April 12, 1918. Construction work began June 27, 1918. The engineer's preliminary estimate was $8,602.00, the contractor's bid, $8,700.00. The value of work done during the year is $8,054.40. The work was accepted December 4, 1918, and the final account, amounting to $8,054.40, was approved by the Canal Board January 15, 1919.

A. P. Mussi, Assistant Engineer, was in charge.

The delivery of brick and a small amount of excavation had been done prior to July 1, 1918. The excavation for the brick pavement along the dockwall and for the macadam pavement was done during July and August, 1918. The concrete foundation was placed during August and the brick during September. A small portion of the macadam was placed during September, and in October the macadam north and east of the freight-house was completed and the bottom course placed on the approach to the terminal also a portion of the drainage ditch was excavated. The balance

of the work was completed by November 18. Considerable trouble was experienced by the contractor in obtaining and keeping labor on this contract.

Terminal Contract No. 37 — *Canajoharie*

This contract is for the construction of a harbor and dockwall near the outlet of Canajoharie creek at Canajoharie. It was awarded to Holler & Shepard, being signed on August 26, 1915. Construction work began June 16, 1916. The engineer's preliminary estimate was $33,832.00, the contractor's bid, $32,272.00. The value of work done during the year is $4,936.63. The work was accepted November 19, 1918, and the final account, amounting to $31,436.63, was approved by the Canal Board April 16, 1919. The amount paid on extra work orders to date is $67.71.

T. J. Loonie, Assistant Engineer, was in charge.

During the year concrete pavement has been placed back of the dockwalls, fender timbers have been bolted to the wall and spoil-banks have been graded. Work was completed in October.

Terminal Contract No. 222 — *Canajoharie*

This contract is for constructing a frame freight-house and depressed roadway at Canajoharie. It was awarded to J. A. Laporte, being signed on August 23, 1918. Construction work began in September, 1918. The engineer's preliminary estimate was $4,000.00, the contractor's bid, $4,195.00. The value of work done during the year is $4,206.40. The work was accepted November 19, 1918, and the final account, amounting to $4,206.40, was approved by the Canal Board February 13, 1919.

H. W. Jewell, Junior Assistant Engineer, was in charge.

The work of building the freight-house and grading the roadway was virtually all done during October, 1918.

Terminal Contract No. 101

This contract is for furnishing and installing steel stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. It was awarded to E. Brown Baker, being signed on December 18, 1916. On February 21, 1917, it was

assigned to the Mohawk Dredge & Dock Co., Inc., and this assignment was approved by the Superintendent of Public Works March 26, 1917. The engineer's preliminary estimate was $21,-890.90, the contractor's bid, $31,790.90. Excess metal to the value of $6,510.00 has been authorized by the Canal Board. The work was accepted December 4, 1918, and the final account, amounting to $36,611.92, was approved by the Canal Board December 27, 1918. The amount paid on extra work orders during the year is $2,966.03, total to date, the same, all at Little Falls.

One of these derricks has been installed at Little Falls, the final account for which amounted to $6,011.50.

G. A. Ensign, Assistant Engineer, was in charge.

Final account of extra work order dated December 11, 1917, amounting to $1,776.03 was approved by the Canal Board August 14, 1918.

Final account of extra work order dated April 26, 1918, amounting to $1,190.00 was approved by the Canal Board January 15, 1919.

The derrick at Little Falls was nearly completed at the beginning of the fiscal year. The final estimate was prepared during this year.

Terminal Contract No. 221

This contract is for constructing a frame freight-house at Herkimer and an extension to freight-house at Little Falls. It was awarded to Kennedy & Scullen Construction Co., Inc., being signed on August 30, 1918. The engineer's preliminary estimate was $6,100.00, the contractor's bid, $6,122.00. The value of work done during the year is $5,914.10. The work was accepted March 19, 1919, and the final account, amounting to $5,914.10, was approved by the Canal Board March 19, 1919. The amount paid on extra work orders to date is $379.11.

H. W. Jewell, Junior Assistant Engineer, was in charge.

An extra work order dated October 29, 1918, provides for building partitions in end of freight-house extension at Little Falls. The final account, amounting to $379.11 was approved by the Canal Board January 22, 1919.

This work was all done during the fall of 1918.

Terminal Contract No. 27-P—Frankfort

This contract is for paving the terminal site at Frankfort. It was awarded to Patrick W. Mulderry, being signed on April 12, 1918. The engineer's preliminary estimate was $4,100.00, the contractor's bid, $4,446.00. The value of work done during the year is $3,938.45. The work was accepted November 13, 1918, and the final account, amounting to $3,938.45, was approved by the Canal Board February 19, 1919.

C. W. Wilbur, Junior Assistant Engineer, was in charge.

All of the work was done during the summer and early fall.

Canal Maintenance

REMOVAL OF BARS BELOW LOCK NO. 8, AT SCOTIA

On April 13, 1918, the Superintendent of Public Works entered into an agreement with Holler & Shepard for the removal of bars in the Barge canal channel below lock No. 8, at Scotia, payment to be made on a basis of a specified daily rental for plant plus labor and material necessary to carry on the work.

This work was in charge of M. J. Quinn, Junior Assistant Engineer, with office at Schenectady.

In July, 1918, the dipper-dredge belonging to this company continued excavating the gravel bar just below lock No. 8, at Scotia, placing the material along the north bank of the river between Stas. 1345 and 1360. On July 9, the dredge discontinued work at this locality and moved downstream to a point about half way between lock No. 8 and the Scotia trolley bridge, where on the 12th it started removing another bar and continued until August 6, the material being spoiled along the Scotia dike on the north side of the river. After this work was discontinued the dredge left this residency, on August 7, 1918. Subsequent to July 1, 1918, this dredge removed about 8,500 cu. yds. of material from the canal channel.

The cost of this work prior to July 1, 1918, was $8,834.47. During the past year two estimates for this work, amounting to $7,622.61, were approved by this office, making the total cost of the work $16,457.08.

REMOVAL OF BARS BETWEEN FONDA AND INDIAN CASTLE

On April 22, 1918, the Superintendent of Public Works entered into an agreement with the American Pipe and Construction Co., Robert Wetherill, Receiver, for the removal of bars in the Barge canal channel between Fonda and Indian Castle, payment to be made on the basis of a specified daily rental of plant plus labor and material necessary to carry on the work.

The portion of this work located within the limits of this residency was looked after during the past year by Frank S. Belotti, Engineering Assistant, working from the residency office at Amsterdam.

During July, 1918, the excavation of bars was continued by the dipper-dredge at a point about two miles east of lock No. 13, at Yosts, and at a point just west of the Fonda–Fultonville bridge. This material was spoiled along the south bank of the river near Sta. 2840 and along the south bank about a mile east of the Fonda–Fultonville bridge. Considerable time was spent in locating the large boulders it was necessary to remove in the vicinity of the Fonda terminal and in changing the dipper of the dredge for a clam-shell bucket.

On July 29, this dredge moved to the Fonda terminal, where it was dismantled, and on August 1 it was taken to Mindenville to remove a large bar just below lock No. 16. The removal of this bar was completed about the middle of August and then the dredge cleaned the channel downstream from lock No. 16 to a point about one-half mile west of the St. Johnsville bridge. This material was spoiled along the north and south banks of the river about a quarter to a half-mile east of the St. Johnsville bridge. The work in the vicinity of the St. Johnsville bridge was discontinued on September 12, the dredge being dismantled and taken to Indian Castle, to remove a bar in the channel at that place. This bar is located within the limits of what was then residency No. 4.

The work at Indian Castle was finished and the dredge returned to the Mohawk River residency on October 16, being assembled just east of the St. Johnsville bridge, where the work of removing large boulders and high spots in the channel was resumed, the material being spoiled along the banks about one-half mile east of the bridge. This work was suspended on November 2, and the

dredge was again dismantled and moved to lock No. 9, to be used there in removing the coffer-dam built for repairs to the dam.

With the removal of the dredge from the vicinity of St. Johnsville, this agreement was terminated. After July 1, 1918, the dredge removed about 14,200 cu. yds. of material from the channel under this agreement.

Prior to July 1, 1918, one estimate for this work, $5,900.44, had been approved by this office. During the past year six additional estimates have been approved, amounting to $31,535.90 and making the total cost of this work $37,436.34.

REMOVAL OF BARS IN THE VICINITY OF CANAJOHARIE

On April 14, 1919, the Superintendent of Public Works entered into an agreement with the American Pipe and Construction Co. for the removal of bars in the Barge canal channel in the vicinity of Canajoharie, payment to be made on the basis of a specified daily rental for plant plus labor and material necessary to carry on the work.

This work has been looked after by Frank S. Belotti, Engineering Assistant, working from the residency office at Amsterdam.

Dipper-dredge No. 3, together with tug and scows left the harbor at Cranesville and arrived at Canajoharie on April 28, 1919. The balance of the month was spent in rigging up the dredge preparatory to removing a large bar in the channel just below dam No. 10 and lock No. 14, at that point. Early in May a cut was made through this bar along the lower guide wall to allow navigation to pass into the lock. The dredge has continued work on this large bar during May and June, removing approximately 21,705 cu. yds. of material to July 1, 1919.

To July 1, 1919, three estimates, totaling $11,600.88, have been approved by this office in connection with this work.

LOCK No. 10, CRANESVILLE

During the year the Department of Public Works made quite extensive repairs to lock No. 10, at Cranesville. The progress of this work was inspected by forces from this office and reports were sent from time to time to the Division Engineer. Measurements were taken several times at different periods with the lock empty and full, to determine any movement of the river wall of the lock.

A large crack in the floor of the lock along the construction joint parallel with the river wall was discovered. The forces of the Department of Public Works drilled holes in the floor of the lock and in the foundation under the river wall. Voids were found and later were filled with gravel and grout. The crack in the floor of the lock was also filled. The stone in old Erie canal lock No. 26 was removed and hauled to the site of lock No. 10. This stone was then handled by means of a derrick and placed outside of and against the river wall of the lock below the apron of the dam. When the stone work was placed against the wall the joints were all grouted.

No estimates were given on this work as it was done by the forces of the Superintendent of Public Works and was not under the direction of this office except in a general way.

MISCELLANEOUS

During the past year the dam at Scotia has been investigated. The concrete around one of the shoes, against which the upright rests, was found to have been washed away and a large irregular crack was discovered in the concrete apron in the middle span of the dam. The repairs at this dam are being made at the present time by forces of the Superintendent of Public Works.

During the year cross-sections were taken and investigations were made at the other dams on this residency, to determine their condition.

A detailed report of the work necessary for maintenance of the canal during the coming year was made and sent to the Division Engineer.

When navigation opened on this section of the canal for the season of 1919, it was necessary to locate buoys and stake lights for marking the Barge canal channel, and considerable time was devoted to this work by employees of this Department on this residency. During the past year many of the buoys were displaced, owing to floods and other causes. These were replaced by the Department of Public Works with the assistance of the engineers of this Department.

At the close of navigation in 1918 it was estimated that 4,000 cu. yds. of material had been brought down Castle creek and deposited in front of the dam. This material is distributed now

along the prism from the guard-gate to the end of the land cut near Rocky Rift dam.

During the winter concrete marker posts, to facilitate finding the offset center line points in the field, were made and the work of placing them has been completed from Mindenville to Little Falls.

Field and Office Work

Estimates of work done and progress of the construction work have been made weekly and monthly to the Division Engineer's office, also estimates prepared for extra work orders and agreements under construction during the year.

Investigations and surveys were made for grants of land under the waters of the Mohawk river at Amsterdam for the Atlas Knitting Company, and also at Schenectady for the American Locomotive Company. Application was received from the American Locomotive Company for several revisions in their maps. These maps were revised and returned to Albany.

The condition of the channel at the Schenectady terminal was investigated and the amount of fill at that point was estimated. The sweeping of the Barge canal channel from lock No. 16, at Mindenville, as far east as lock No. 14, at Canajoharie, was completed during the year. A plan and estimate were made for dredging a channel from the canal prism to the retaining wall along the property of the Chalmer's Knitting Co. at Amsterdam.

An investigation and report were made on the proposed excavation of a slip, or channel, from the Barge canal channel across State land and the old Erie canal to the Cushing Stone Co. property at Cranesville.

An estimate and plan were prepared for a proposed additional widening of the prism below dam No. 5, at Rotterdam.

A survey was made and mapped, showing the blue line intersection with the Amsterdam city lines.

An investigation was conducted and measurements taken to determine the condition of the channel and the maximum clearance between the piers of the New York Central R. R. bridge at Schenectady.

The base line and center line data for Sections Nos. 2 and 3 have been compiled and tabulated on standard forms and sent to the Albany office.

The gages located at Middleburg, Kast Bridge, and the Schenectady Boat Club were reset and changed data sent to the Albany office.

Measurements of controlling dimensions of all locks on this residency and the minimum clearance between the lock gate fenders were taken and sent to Albany.

The Sherman complaint, on contract No. 14, and the Eggleston and the Barhydt complaints on contract No. 20-D, were investigated as to damages done to these properties, due to flooding.

A survey was made and an appropriation map sent in for the A. Francis Bradt parcel at Rotterdam, on contract No. 185, and a release for spoil was executed covering certain lands of E. J. Millette of Rotterdam, on the same contract.

An appropriation map for lands of Jay Van Evra, on contract No. 20-C, was prepared; also release and retention maps for parcel No. 5171, Lasher, on contract No. 20-C.

An appropriation map of the Sherman property near Vischer Ferry, on contract No. 14, was prepared; also reports and sketches prepared in connection with the release of parcels Nos. 2112, 2023, 2076, 2360 and 2366, on contract No. 14.

An appropriation map of the Watson S. Vrooman lands below Rotterdam was prepared, also a map to supersede parcel No. 3324-A, on contract No. 20-D. Reports and sketches were made in connection with the release of parcels Nos. 3151 and 5132, on contract No. 20-D.

Considerable time has been spent in preparing charts and data to be used in connection with the claim of the American Pipe and Construction Co. on contract No. 20-D.

Release and retention maps were prepared for parcel No. T-50, terminal contract No. 12, at Amsterdam.

The matter of installing a water-supply system for the Guy Park House at Amsterdam, making connection with the city water-main across the N. Y. C. tracks, has been investigated and a report and estimates submitted to the Special Deputy State Engineer.

During the past year some work has been done towards removing bars and obstructions above grade in the Barge canal channel. On July 1, 1919, this work is in progress and will probably be carried on during the coming year.

Within the limits of this residency several claims have been made against the State, due to the eroding of banks. A study of this matter should be made and the banks should be protected in some way in order to prevent future washing away of the banks and consequent damage to lands along the river. This work would necessarily come under maintenance and for the ensuing year the quantities of bank protection would have to be estimated.

At various times during the past year on account of high water and in a few cases for the purpose of making repairs, etc., boatmen have been compelled to tie up along the line of the canal, which lies in river section. In most cases this was done at terminal walls, but where a terminal was not near at hand, it was necessary to use the guide walls of the nearest lock. Although this practice has not as yet congested traffic on the canal, it may do so in the future, especially with increased traffic. I believe, therefore, that a study should be made, looking toward the establishment of suitable mooring places at convenient intervals along the river, so as to provide for increased traffic and for emergencies such as accidents, etc. I take the liberty of mentioning this matter, since I believe it to be a coming necessity in connection with the maintenance of the canal.

Blue Line Surveys

Since fewer men were available than were necessary for the construction work upon the residency, the blue line work was for the most part done during slack times in the construction work. Between October 1, 1918, and April, 1919, there was practically no blue line field work done, except at Little Falls.

At Little Falls the encroachment surveys were made and the encroachments plotted upon the various parcels to be abandoned by the State to the city.

East of Little Falls the following work has been done: The topographic work from Mindenville to Little Falls has been finished, the 40-foot maps as far as Indian Castle have been plotted, and the points staked out in the field and traverses run over them. West of Indian Castle creek the topography has been taken.

The Clinton ditch, or original Erie canal, blue line work has

been completed from Mindenville to Indian Castle creek, with the exception of plotting the 100-foot maps.

The Rocky Rift feeder work has been completed and the 100-foot maps sent to Albany.

CHAMPLAIN CANAL, RESIDENCIES NOS. 1, 2 AND 3

Assistant Engineer in charge R. D. Hayes reports:

These residencies cover the entire Champlain canal, Waterford to Whitehall, and include also the terminals on Lake Champlain. The work has been directed from the Mechanicville office.

Numerous release and retention maps have been prepared and reports on various claims submitted to the Division Engineer.

Recording gages, two on the Glens Falls feeder and one at lock No. 9, have been installed.

In connection with Barge canal construction our engineers have been actively engaged in assisting the Department of Public Works, making surveys, sweeping the channel, setting buoys and doing general maintenance work.

Reports follow on contracts Nos. 1-A, 73-A, 131-A and 168 and terminal contracts Nos. 13, 26, 101 and 201.

Contract No. 73-A

This contract is for completing the construction of the canal from Northumberland to Stillwater. Length, 15 miles. It was awarded to the Great Lakes Dredge & Dock Co., being signed on January 15, 1916. The engineer's preliminary estimate was $432,045.00, the contractor's bid, $321,679.92. The contract price as modified by alterations Nos. 1, 2, 3 and 4 is $506,169.67. Excess quantities to the value of $2,270.00 have been authorized by the Canal Board.

C. A. Curtis, Assistant Engineer, and Mott Palmer, Junior Assistant Engineer, were in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective October 9, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the law. The actual cost of the work from April 7, 1917, to

October 9, 1918, was $290,695.71 and payment of balance due on this amount was authorized by the Canal Board on September 17, 1919. The final account for work done prior to April 7, 1917, amounting to $286,278.59, was approved by the Canal Board on May 21, 1919.

This contract has been completed and the total payment, including extra work orders, was $580,344.32.

An extra work order dated September 5, 1916, provided for placing six timber snubbing-posts above guard-lock No. 10. The final account, amounting to $247.55, was approved by the Canal Board May 21, 1919.

The contractor, using equipments of the American Pipe and Construction Co., the Troy Public Works Co. and Hawley Miller in addition to his own plant, completed prism excavation between locks Nos. 4 and 5 by October 9, 1918.

The snubbing-posts called for by the work order of September 5, 1916, were placed.

Contract No. 168

This contract is for constructing concrete-capped timber guide-cribs near locks Nos. 3, 5 and 6, Champlain canal. It was awarded to Bronk and Kimmey, being signed on July 29, 1918. The engineer's preliminary estimate was $63,505.60, the contractor's bid, $77,895.12. The contract price as modified by alteration No. 1 is $85,727.40. The value of work done during the year is $67,240, total done to date, the same. The amount paid on extra work orders during the year is $2,555.48, total to date, the same.

C. A. Curtis, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board March 19, 1919, provides for three additional cribs below lock No. 3, Mechanicville. It increases the contract price by $7,832.28.

An extra work order dated September 24, 1918, provides for restoring cribs displaced by boats. The final account, amounting to $2,555.48, was approved by the Canal Board January 22, 1919.

An extra work order dated May 29, 1919, provides for placing rubbing strips on piers below lock No. 3, Mechanicville.

The 15 cribs called for below lock No. 3, were completed during 1918. The timber cribs with stone filling above lock No. 5 were

also placed in 1918. Timber for the cribs below lock No. 6 was provided. Under alteration No. 1 three additional cribs were placed below lock No. 3. Concrete work and the building of booms was started above lock No. 5 and below lock No. 6.

Previous to the placing of the concrete caps on the cribs below lock No. 3, an ore fleet from Lake Champlain struck two of these cribs and knocked them off their location. To place them back in line the contractors were given an extra work order, under which the work was done.

Contract No. 131-A

This contract is for completing the reconstruction of the highway bridge crossing the main channel of the Hudson river at Schuylerville. It was awarded to Michael Fitzgerald, being signed on March 5, 1917. Construction work began in April, 1917. The engineer's preliminary estimate was $30,753.00, the contractor's bid, $39,634.50. Excess foundation piles to the value of $140.00 have been authorized by the Canal Board. The work was accepted July 17, 1918, and the final account, amounting to $37,276.28, was approved by the Canal Board September 10, 1918. The amount paid on extra work orders to date is $640.04.

C. A. Curtis, Assistant Engineer, was in charge.

Construction work was completed prior to July 1, 1918. The contract was accepted and the final account approved during the past fiscal year.

Contract No. 1-A

This contract is for completing the canal from Crocker's Reef to Fort Edward. It was awarded to Holler & Shepard, being signed on August 31, 1914. The engineer's preliminary estimate was $90,811.00, the contractor's bid, $120,459.40. The contract price as modified by alterations Nos. 1, 2 and 3 is $141,540.20. Excess excavation to the value of $67,200.00 has been authorized by the Canal Board.

James B. Foote, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 24, 1918. The cancelation became effective August 14, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the law. The actual cost of the work from April 7,

1917, to August 14,1918, was $44,663.42 and payment of balance due on this amount was authorized by the Canal Board on April 2, 1919. The final account for work done prior to April 7, 1917, amounting to $166,941.19, was approved by the Canal Board on April 2, 1919.

This contract has been completed and the total payment, including extra work orders, was $212,254.61.

An extra work order dated March 29, 1917, provides for furnishing, placing and removing flash-board at Crocker's Reef dam. The final account, amounting to $650.00, was approved by the Canal Board August 14, 1918.

The only contract work done during the year was that performed under the work order of March 29, 1917.

Terminal Contract No. 13 — *Schuylerville*

This contract is for constructing a guard-lock and bridge at Schuylerville. It was awarded to Lou B. Cleveland, being signed on December 29, 1914. It was assigned to the Kendar Engineering and Construction Co., Inc., and this assignment was approved by the Superintendent of Public Works December 16, 1915. The engineer's preliminary estimate was $61,664.60, the contractor's bid, $42,742.80.

The status of this contract has not changed during the past year. Construction work has been finished, the final estimate has been made, but the settlement is still in litigation.

Terminal Contract No. 201 — *Whitehall*

This contract is for constructing terminal warhouses at Albany and Whitehall. It was awarded to J. A. Laporte, being signed on January 2, 1917. The engineer's preliminary estimate was $59,300.00, the contractor's bid, $65,174.85. The contract price as modified by alteration No. 1 is $71,432.30. The engineer's preliminary estimate for the warehouse at Whitehall was $22,800.00, the contractor's bid, $28,068.35.

W. L. Caler, Assistant Engineer, is in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 17, 1918. The cancelation became effective August 31, 1918, on approval of the

Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 31, 1918, was $42,790.16 and payment of balance due on this amount was authorized by the Canal Board on February 26, 1919. No work was done prior to April 7, 1917.

The contractor is completing the work and the total payments to date, including extra work orders, are $54,234.00.

At the Whitehall warehouse during the year excavation for the depressed roadway was made and fenced. The side walls were completed and stuccoed. The tile was placed and the chimney was completed. The partitions were put in, the walls were plastered, the metal ceiling was built over the second floor and the stairs and railing around the stair well were placed. The concrete floors were laid and the walls painted in office and warehouse. Metal trim was placed in the office. The skylights, the entrance doors, and the windows and doors in both warehouse and office were placed, and the copper roof was put on the marquise. Plumbing and electrical wiring were completed and a hot-water heating system installed. A 4-inch pipe line was laid to connect the building with the city main. Fire hose, brackets and valves were installed on the fire risers.

Terminal Contract No. 101

This contract is for furnishing and installing steel stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. It was awarded to E. Brown Baker, being signed on December 18, 1916. On February 21, 1917, it was assigned to the Mohawk Dredge and Dock Co., Inc., and this assignment was approved by the Superintendent of Public Works March 26, 1917. The engineer's preliminary estimate was $21,890.90, the contractor's bid, $31,790.90. Excess metal to the value of $6,510.00 has been authorized by the Canal Board. The work was accepted December 4, 1918, and the final account, amounting to $36,611.92 was approved by the Canal Board December 27, 1918. The amount paid on extra work orders during the year was $2,966.03, total to date, the same.

One of these derricks has been installed at Whitehall, the final account for which amounted to $6,381.16.

W. L. Caler, Assistant Engineer, was in charge.

Terminal Contract No. 26 — Rouses Point

This contract is for constructing a pier and basin at Rouses Point. It was awarded to John E. Byron & Co., being signed on October 30, 1916. The engineer's preliminary estimate was $51,200.00, the contractor's bid, $55,678.50.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective October 9, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to October 9, 1918, was $23,456.67 and payment of balance due on this amount was authorized by the Canal Board on March 19, 1919. No work was done prior to April 7, 1917.

Operations were suspended on December 21, 1917, and no work has been done since that time.

Canal Maintenance

Under a special agreement between D. B. La Du and the Superintendent of Public Works, dated April 16, 1919, for dredging the canal and removing high spots south of Fort Edward, 17,800 cubic yards of material were removed.

Under a special agreement between Dwight B. La Du Company and the Superintendent of Public Works, dated May 14, 1919, and June 3, 1919, for placing riprap at Collins island, below Fort Edward, and at other places, the work at Fort Edward was completed and that at Collins island begun.

Under an agreement between J. W. Holler and the Superintendent of Public Works, dated May 29, 1918, for dredging the channel of the Barge canal between lock No. 8 and the Comstock bridge, 27,705 cubic yards of material were removed.

Under agreements between J. W. Holler and the Superintendent of Public Works, dated April 3, 1919, and May 22, 1919, for

dredging bars from lock No. 8 to Whitehall and cleaning locks, 4,620 cubic yards of material were removed.

Under an agreement between D. B. La Du and the Superintendent of Public Works, dated May 9, 1919, for removing a ledge of rock in the vicinity of the foot-bridge at Whitehall, rock drilled and blasted.

NEW YORK RESIDENCY

Senior Assistant Engineer Edward Amderberg reports:

The principal work of the New York residency for the past year has been the supervision of construction work relating to the improvement of Barge canal terminals in this city. Progress was made towards the completion of two terminals for the borough of Manhattan, two for Brooklyn, one for the Bronx and one for Queens. Plans were prepared for developing the two additional sites owned by the State in the borough of Queens.

In addition to the work connected with the Barge canal terminals, various miscellaneous engineering matters were looked after, as decided in the following five paragraphs:

The New York–New Jersey Port and Harbor Development Commission in its studies for improving port conditions in New York harbor decided to investigate the feasibility and cost of constructing a harbor belt line railroad which would intersect the various trunk line railroads in New Jersey some distance inland from the existing terminals. At the request of this Commission, this survey was undertaken by the State Engineer and Surveyor. The survey was started in September, 1918, and was continued to March, 1919, when it was necessary to terminate it temporarily because of lack of funds in the hands of the Commission. The field survey has been completed sufficiently to locate a center line from Piermont on the Hudson to Newark bay, a distance of 45 miles. It is is expected that the remaining work, which amounts principally to the completion of the maps, will be undertaken the coming year. J. O. Burt and E. H. Anderson, Assistant Engineers, acted as locating engineers on this work.

In connection with the investigations of the Jamaica Bay–Peconic Bay Canal Board, under chapter 317, Laws of 1917, for

a proposed canal along the south shore of Long Island, a survey was made for a third alternative line across the Rockaway peninsula known as the "Far Rockaway route." A survey for a fourth alternative line, known as the "Lynbrook route," is under way.

Under chapter 427, Laws 1918, a survey of Mill river in Nassau county was made.

Surveys have been made and maps prepared in connection with five applications for grants of land under water in this vicinity.

Plans were prepared for repairs to a pier at the Swinburne Island State quarantine station.

Reports on terminal contracts Nos. 19, 38, 42, 44, 44-P, 52, 52-P, 55, 56, 77, 102, 103-A, 105, 117, 207, 207-P, 207-H, 217, 217-P, 218, 223 and 227 and parts of terminal contracts Nos. 106 and 109 follow; also on contracts for a highway at Rockaway Point, repairs to the landing pier and the north pier at the Hoffman Island State quarantine station and repairs to sea-walls between East Marion and Orient.

Terminal Contract No. 52 — *Pier* 6, *East River*

This contract is for repairing and extending existing Pier 6, East river. It was awarded to Kaufman & Garcey, being signed on July 27, 1916. Construction work began October 13, 1916. The engineer's preliminary estimate was $89,974, the contractor's bid, $91,317.75. The contract price as modified by alterations Nos. 1, 2, 3 and 4 is $102,553.75. The amount paid on extra work orders during the year is $130, total to date, $2,856.04.

Ely Gamse, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective August 31, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 31, 1918, was $100,656.77 and payment of balance due on this amount was authorized by the Canal Board on February 13, 1919. The final account for work done prior to April 7, 1917, amounting to $31,491.89, was authorized by the

Canal Board on January 29, 1919. The total payments, including extra work orders, on the completed contract were $135,004.70.

An extra work order dated December 7, 1917, provided for replacing stone block payment back of the bulkhead wall. The final account, amounting to $130.00, was approved by the Canal Board September 24, 1918.

Work on the contract was started October 13, 1916, and had been practically completed at the close of the last fiscal year. During July and August, 1918, some remaining bolts in low-water timber connections were placed at favorable tides and other miscellaneous work was done. On August 28, 1918, all work had been completed.

Terminal Contract No. 103-A

This contract is for furnishing, installing and testing two portable package-freight conveyors. It was awarded to the Brown Portable Conveying Machinery Co., being signed on October 3, 1917. The engineer's preliminary estimate was $3,900.00 each, the contractor's bid, $4,100.00 each. The contract price, on this residency, as modified by alteration No. 1 is $5,626.80.

Ely Gamse, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board April 16, 1919, provides for furnishing and delivering a portable inclined elevator at Pier 6 and for changing the carriages of the portable package-freight conveyors. It increases the contract price, on this residency, by $1,526.80.

One of the portable package conveyors and the portable package inclined elevator were delivered at Pier 6 during June, 1919. These machines require adjustment and repairs before acceptance tests can be made.

Terminal Contract No. 106

This contract is for furnishing fourteen two-ton steam tractor cranes for Barge canal terminals. Two of these are for Pier 6 and one for Long Island City. The contract was awarded to John F. Byers Machine Co., being signed on February 14, 1918. The engineer's preliminary estimate was $5,250.00 per crane, the contractors bid, $5,265.00 per crane. The contract price as

modified by alteration No. 1, is $5,515.00 per crane. The value of the work done at Pier 6, East river, New York city, during the year is $1,370.00. The contract was accepted September 24, 1918, and the final account, amounting to $11,030.00 for Pier 6, was approved by the Canal Board October 9, 1918.

Ely Gamse, Assistant Engineer, was in charge.

Since the last report two clam-shell buckets in connection with the two cranes for Pier 6 were delivered. The crane for the Long Island City terminal was delivered temporarily at Little Falls, for use there, pending a demand for it in this city. The transfer of the latter crane to New York was never ordered, but the work was accepted in September, 1918, and the contract closed.

Terminal Contract No. 207 — *Pier* 6, *East River*

This contract is for constructing a freight-shed and head-house on Pier 6, East river. It was awarded to I. J. Stander & Co., Inc., being signed on January 11, 1918. Construction work began in December, 1918. The engineer's preliminary estimate was $133,500.00, the contractor's bid, $128,250.01. The value of work done during the year is $113,390.00, total done to date, the same.

Ely Gamse, Assistant Engineer, is in charge.

Work was started in the field the last of December, 1918. To date the contractor has erected practically all the steelwork. The remaining work comprises the completion of doors and windows and considerable work in connection with the partitions for the offices of the head-house.

Terminal Contract No. 207-P — *Pier* 6, *East River*

This contract is for installing a plumbing and water-supply system in the freight-shed on Pier 6, East river. It was awarded to Jarcho Bros., Inc., being signed on April 16, 1918. The engineer's preliminary estimate was $6,000.00, the contractor's bid, $6,650.00. The value of work done during the year is $5,190.00, total done to date, the same.

Ely Gamse, Assistant Engineer, is in charge.

Work was started on this contract in the middle of March, 1919. All piping for the plumbing and water-supply systems has been

completed. The remaining work involves the placing of the fixtures, which will not be installed until the completion of plastering, etc., by the contractor on terminal contract No. 207.

Terminal Contract No. 207-H — *Pier* 6, *East River*

This contract is for installing a heating system in the freight-shed on Pier 6, East river. It was awarded to Miller & Brady, Inc., being signed on March 22, 1918. The engineer's preliminary estimate was $3,250.00, the contractor's bid, $2,352.00. The value of work done during the year is $1,170.00, total done to date, the same.

Ely Gamse, Assistant Engineer, is in charge.

Work on this contract was started on June 12, 1919. To date the boiler has been installed, some of the piping has been assembled and some of the hangers for ceiling radiators placed.

Terminal Contract No. 52-P — *Pier* 6, *East River*

This contract is for paving Pier 6, East River, New York city. It was awarded to the Sicilian Asphalt Paving Co., being signed on June 13, 1919. The engineer's preliminary estimate was $10,000.00, the contractor's bid, $11,225.00.

Work has not yet begun.

Terminal Contract No. 105 — *Pier* 6, *East River*

This contract is for installing electric equipment for light, power and battery-charging, and auto-truck scales at Pier 6, East river. It was awarded to the Lord Electric Co., being signed on June 28, 1918. The engineer's preliminary estimate was $17,742.40, the contractor's bid, $16,000.50. The value of work done during the year is $8,370.00, total done to date, the same.

Ely Gamse, Assistant Engineer, is in charge.

An extra work order dated July 15, 1918, provides for running a feeder line for electric service on Pier 5, East river. The final account, amounting to $2,842.68, was approved by the Canal Board May 7, 1919.

An extra work order dated April 26, 1919, provides for raising the metal ducts along the east side of the pier-shed so as to avoid

interference with the opening of the warehouse doors. The final account, amounting to $98.75, was approved by the Canal Board May 21, 1919.

Work on this contract was started on July 9, 1918, in connection with the extra work order providing for running a feeder line out on Pier 5 from Pier 6. This extra work was completed in December. Work on the original contract was started early in February of this year. To date practically all of the rigid metal conduit and outlet boxes have been placed. A considerable proportion of the conductors have been pulled through the conduits. Some of the lighting and power fixtures have been placed. The auto-truck scales have been installed. The switchboard and the balancer sets have not been installed as yet.

Terminal Contract No. 109

This contract is for furnishing electric capstans and trolley hoists at Pier 6, East river, and West 53d street pier, New York city, and electric capstans at the Utica terminal lock. It was awarded to the General Electric Co., being signed on August 2, 1918. The engineer's preliminary estimate was $19,000.00, the contractor's bid, $18,536.00. The value of work done during the year is $1,170.00, total done to date, the same. The amount paid on extra work orders during the year is $219.00, total to date, the same.

Ely Gamse, Assistant Engineer, is in charge.

An extra work order dated September 24, 1918, provides for furnishing a motor with starter, pulley and base for a portable conveyor at Pier 6. The final account, amounting to $219.00, was approved by the Canal Board November 13, 1918.

One winch has been delivered at Pier 6.

Terminal Contract No. 102 — *Pier* 6, *East River*

This contract is for furnishing and installing two 3-ton, electric, semiportal, revolving, jib cranes on Pier 6, East river. It was awarded to the Edward F. Terry Mfg., Co., being signed on January 21, 1919. The engineer's preliminary estimate was $45,362.00, the contractor's bid, $41,081.00.

Shop work is under way.

Terminal Contract No. 56 — *Pier* 5, *East River*

This contract is for repairing Pier 5, East river. It was awarded to I. J. Stander & Co., Inc., being signed on June 28, 1918. Construction work began June 28, 1918. The engineer's preliminary estimate was $20,400.00, the contractor's bid, $27,-159.60. Excess iron castings to the value of $10.40 have been authorized by the Canal Board. The value of work done during the year is $26,904.68, total done to date, the same. The work was accepted February 26, 1919, and the final account, amounting to $26,904.68, was approved by the Canal Board June 11, 1919. The amount paid on extra work orders during the year is $2,889.71, total to date, the same.

Ely Gamse, Assistant Engineer, is in charge.

An extra work order dated October 5, 1918, provides for jacking up range timbers, placing hardwood shims under same and also for replacing existing posts which are not of sufficient length. The final account, amounting to $2,889.71, was approved by the Canal Board May 7, 1919.

The repair work involved the repair of the ends of the timber bents an the sides of the pier where they had decayed and the placing of an entire new fender system. The required work was completed the latter part of February, 1919.

Terminal Contract No. 19 — *Greenpoint*

This contract provides for dredging the terminal basin, constructing a new reinforced concrete bulkhead wall and pier, and repairing two existing timber piers and a timber bulkhead at the Greenpoint terminal, borough of Brooklyn. It was awarded to McHarg-Barton Co., being signed on Nevember 24, 1916. Construction work began February 20, 1916. The engineer's preliminary estimate was $193,500.00, the contractor's bid, $207,-383.00. The contract price as modified by alterations Nos. 1 and 2 is $211,513.00. Excess quantities to the value of $1,835.00 have been authorized by the Canal Board. The amount paid on extra work orders to date is $9,356.80.

J. B. Doughty, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancela-

tion became effective August 14, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 14, 1918, was $218,767.51 and payment of balance due on this amount was authorized by the Canal Board on January 15, 1919. The final account for work done prior to April 7, 1917, amounting to $6,312.78, was authorized by the Canal Board on December 27, 1918.

The total payments on the completed work, including extra work order and the work done by the State Engineer, amount to $292,191.18.

At the close of the last fiscal year the dredging, the construction of the reinforced concrete bulkhead and the repairs to the Dupont street pier had been practically all completed. The reinforced concrete pier had been 40 per cent completed and the repairs to the old timber crib were well under way.

A considerable amount of work remained to be done after August 14, 1918, and most of it was performed through the contractor on a basis of the actual and necessary cost and expense as prescribed in chapter 585, Laws of 1918. By December 1, 1918, only a small amount of work remained to be done, but owing to a strike of the dock-builders in this city, the work through the contractor was discontinued. The payments to the contractor for work done after August 14, 1918, aggregated $55,225.96.

The small amount of work remaining to be done on December 1 was performed during January and February by the State Engineer under resolution of the Canal Board dated December 27, 1918, authorizing him to purchase the necessary material and hire the necessary plant and labor at a cost not to exceed $3,000. By February 28, 1919, the work under the State Engineer, amounting to $2,528.13, had been completed.

Terminal Contract No. 223 — *Greenpoint*

This contract is for constructing a terminal freight-shed at Greenpoint, New York city. It was awarded to Post & McCord, being signed on March 20, 1919. The engineer's preliminary estimate was $99,710.00, the contractor's bid, $75,718.94.

J. B. Doughty, Assistant Engineer, is in charge.

An extra work order dated April 1, 1919, provides for repairing an existing concrete warehouse on the site.

Work in connection with the repair of the existing warehouse under the extra work order was started on March 28, 1919, and was completed by the first of June.

Work in connection with the original contract has not been started.

Terminal Contract No. 55 — Gowanus Bay

This contract is for constructing a pier, 150 ft. by 1,220 ft., dolphins, etc., at Gowanus bay terminal. It was awarded to Riverside Contracting Co., being signed on September 4, 1917. Construction work began October 5, 1917. The engineer's preliminary estimate was $513,000.00, the contractor's bid, $509,800.75. The contract price as modified by alterations Nos. 1, 2 and 3 is $507,620.40. The value of work done during the year is $102,750, total done to date, $260,080.

L. T. Howard, Assistant Engineer, is in charge.

Alteration No. 2, approved by the Canal Board January 15, 1919, provides for eliminating the scale pits, for changing the type of capstan settings, for changing the details of the anchorage for the horizontal clamps for the shed footings on the west side of the pier, and for installing conduits and manholes for electric wires. It decreases the contract price by $780.35.

Alteration No. 3, approved by the Canal Board June 25, 1919, provides for eliminating from the site of the contract a portion of the terminal area back of the bulkhead wall. It does not change the contract price.

An extra work order dated May 23, 1919, provides for moving part of the stored materials on the contractor's site to allow stone block pavement to be laid under terminal contract No. 44-P.

The work to date on this contract includes the completion of driving and framing all foundation piles except considerable work remaining to be done in framing the piles under the freight-house and crane rail foundations. Bracing piles have been driven, but considerable framing remains to be done on them. About one-third of the fender piles have been driven. The timber work has been largely completed. The principal lumber still to be placed is in the fender system, the sheathing at the outer end, the grillage

timbers and chocks in the foundations for the concrete blocks, the fender pile caps, etc., of the pier, the pile dolphins and the east pier seat.

The contractor suffered considerable delay because lighters and barges engaged in U. S. Government work trespassed on his site. His work was also held up from November 20, 1918, to January 6, 1919, by a strike of the dock-builders in New York city.

The contractor's plant consists of a floating pile-driver derrick lighter, compressor boat, tanks for timber treatment, etc.

Terminal Contract No. 227 — Gowanus Bay

This contract is for constructing a frame freight-house at Gowanus bay. It was awarded to J. A. Laporte, being signed on April 28, 1919. The engineer's preliminary estimate was $9,750.00, the contractor's bid, $9,189.00. Excess second-class concrete to the value of $300.00 has been authorized by the Canal Board. The value of work done during the year is $8,000.00, total done to date, the same.

L. T. Howard, Assistant Engineer, is in charge.

Work was started on April 23, 1919, and by the end of the fiscal year the carpenter work had been practically completed, a priming coat of paint put on and the electric lighting system partly installed.

Terminal Contract No. 44 — Mott Haven

This contract is for excavating a terminal basin, constructing a dockwall, grading the upland and building approaches for a Barge canal terminal at Mott Haven, near East 138th street, borough of Bronx. It was awarded to Geo. W. Rogers & Co., Inc., being signed on June 8, 1917. Construction work began June 9, 1917. The engineer's preliminary estimate was $170,300.00, the contractor's bid, $193,651.00. The contract price as modified by alteration No. 1 is $191,195.50. The value of work done during the year is $55,370.73. The work was accepted Feburay 26, 1919, and the final account, amounting to $176,110.73, was approved by the Canal Board August 6, 1919.

F. T. Lawton, Assistant Engineer, was in charge.

An extra work order dated February 24, 1919, provides for laying a 6-inch water-main from the street line to the site of the proposed freight-house.

An extra work order, dated March 8, 1919, provides for remodeling an existing building for warehouse purposes.

During the past year the work has comprised the completion of the bulkhead wall, the completion of the upland excavation, the construction of the street and ramp walls, the repairs to the existing crib at the slip and the construction of the steel sheet pile wall. This work was completed by the latter part of February of this year. The repairs to the existing brick building were started the first of March, 1919, and carried to completion by the middle of June.

The contractor's plant consisted of two floating pile-drivers, a derrick-scow, a compressor, etc.

Terminal Contract No. 38 — West 53d Street, North River

This contract is for constructing a pier at the foot of West 53d street, North river. It was awarded to I. J. Stander & Co., Inc., being signed on October 27, 1917. Construction work began November 1, 1917. The engineer's preliminary estimate was $259,000.00, the contractor's bid, $266,064.80. The contract price as modified by alterations Nos. 1 and 2 is $265,550.39. The value of work done during the year is $162.900, total done to date, $214,390. The amount paid on extra work orders during the year is $65.00, total to date, $470.00.

W. C. Bratton, Assistant Engineer, is in charge.

Alteration No. 2, approved by the Canal Board June 25, 1919, provides for the elimination of a part of the backing log and for revised settings for single bitts. It increases the contract price by $47.23.

An extra work order dated August 1, 1918, provides for painting the structural steel delivered and not used and for transporting and placing it in storage at the Greenpoint terminal warehouse. The final account, amounting to $65.00, was approved by the Canal Board September 10, 1918.

An extra work order dated September 13, 1918, provides for altering the crane rail.

An extra work order dated February 5, 1919, provides for additional column footings on the bulkhead wall for the proposed head-house.

During the past year the work has included the driving of all remaining foundation and bracing piles. Fender piles have been 80 per cent driven and framed. Timber framing was very largely completed. The remaining timber work is principally the placing of caps and grillage timbers for concrete footings and can be placed only at low tides, making rapid progress difficult. The concrete footings have been partly built and the crane rail girder partly erected. The concrete deck covering is still to be placed.

The contractor's plant consisted of a floating pile-driver, a compressor plant, two concrete mixers and tanks for treatment of lumber.

Terminal Contract No. 218 — *West 53d Street*

This contract is for constructing a terminal freight-shed at West 53d street, New York city. It was awarded to Donnell-Zane Co., Inc., being signed on May 13, 1919. The engineer's preliminary estimate was $53,969.15, the contractor's bid, $46,549.20.

Construction work has not yet begun.

Terminal Contract No. 217 — *Long Island City*

This contract is for repairing the bulkhead and constructing a freight-house and a crane track at Long Island City. It was awarded to A. E. Norton, Inc., being signed on October 23, 1918. Construction work began December 2, 1918. The engineer's preliminary estimate was $59,850.00, the contractor's bid, $74,806.50. Excess quantities to the value of $5.780.00 have been authorized by the Canal Board. The value of work done during the year is $48,860.00, total done to date, the same. The amount paid on extra work to date is $150.00.

H. W. Hale, Assistant Engineer, is in charge.

An extra work order dated December 27, 1918, provides for furnishing and erecting a 10 ft. by 16 ft. wooden building. The final account, amounting to $150.00, was approved by the Canal Board February 26, 1919.

An extra work order dated May 7, 1919, provides for furnishing and installing a heating plant in the freight-house.

The work done on this contract includes a small percentage of

the bulkhead repairs, the completion of the foundation of the freight-house and the erection of the steelwork, which has been 75 per cent riveted.

Terminal Contract No. 217-P — *Long Island City*

This contract is for installing plumbing and water-supply systems in the terminal freight-house at Long Island City. It was awarded to the Altman Plumbing Co., being signed on May 29, 1919. The engineer's preliminary estimate was $4,000.00, the contractor's bid, $3,765.00. The value of work done during the year is $1,390.00, total done to date, the same.

H. W. Hale, Assistant Engineer, is in charge.

The plumbing installation was started on June 13 and to date the trenching for the water-pipe supply line and for the sewer have been completed and the 4-inch and 6-inch water-pipe lines have been partly installed.

Terminal Contract No. 42 — *Long Island City*

This contract is for paving the terminal site at Long Island City. It was awarded to Leonard Paving Co., Inc., being signed on November 13, 1918. The engineer's preliminary estimate was $54,600, the contractor's bid, $53,579.00. The value of work done during the year is $1,370.

H. W. Hale, Assistant Engineer, is in charge.

Grading was started on March 15, 1919, and to date a certain amount of it has been completed around the freight-house. Also some tile drain has been laid. The work was discontinued temporarily on April 9, pending the completion of the repairs to the bulkhead and the construction of the crane track under terminal contract No. 217.

Terminal Contract No. 44-P

This contract is for paving parts of terminal sites at Mott Haven, Greenpoint and Gowanus bay. It was awarded to the Asphalt Construction Co., being signed on May 13, 1919. The engineer's preliminary estimate was $94,340.00, the contractor's bid, $81,360.00. The contract price as modified by alteration No. 1 is $78,201.20. The value of work done during the year is $22,070, total done to date, the same.

Freight-shed, Greenpoint Terminal, New York City

In addition to this shed there was an existing building at this site which has been altered so as to adapt it for use for storage purposes.

INTERIOR OF FREIGHT-SHED, GREENPOINT TERMINAL, NEW YORK CITY
Erected on a new pier and just being completed.

FRAME FREIGHT-HOUSE AT GOWANUS BAY TERMINAL

The permanent freight-house is to be erected on the pier and will be 1,180 feet long by 106 feet wide and have cargo masts and a conveyor gallery along one side.

TERMINAL AT MOTT HAVEN, NEW YORK CITY

View looking down ramp leading to terminal area. The existing brick building, which has been remodeled so as to adapt it for use as a storage warehouse, is seen in the middle distance.

West 53d Street Terminal, New York City
Erection of pier-shed. Construction of the pier has been in progress during the year.

F. T. Lawton, Assistant Engineer, is in charge at Mott Haven, L. T. Howard, Assistant Engineer, is in charge at Gowanus and J. B. Doughty, Assistant Engineer, is in charge at Greenpoint.

Alteration No. 1, approved by the Canal Board June 25, 1919, provides for elimination of the crane track and the pavement between the freight-house site and the dockwall and for paving the entire area west of the approach driveway at Mott Haven. It decreases the contract price by $3,158.80.

Work was started at the Mott Haven site on May 28, 1919, at the Gowanus site on June 2, and at the Greenpoint site on June 30. At Mott Haven the grading has been completed and 89 per cent of the concrete pavement base has been laid, including concrete edging. At Gowanus the excavation has been completed and practically all the concrete base and edging have been laid.

Terminal Contract No. 77

This contract is for dredging at Piers 5 and 6, East river, at Greenpoint and at Long Island City. It was awarded to New Jersey Shipbuilding & Dredging Co., being signed on May 13, 1919. Construction work began June 13, 1919. The engineer's preliminary estimate was $40,325.00, the contractor's bid, $42,-895.00. The value of work done during the year is $6,770.00, total done to date, the same.

H. W. Hale, Assistant Engineer, is in charge at Long Island City.

A dredge started work at the Long Island City terminal on June 13, 1919, on the outside cut in front of the bulkhead wall. By July 1, a total of 4,926 cubic yards of material had been removed and dumped at sea. The dredging has not yet been started at the other sites.

Terminal Contract No. 117

This contract is for furnishing battery-charging motor-generator sets, with switchboard panels for New York city terminals. It was awarded to The Electric Products Co., being signed on June 20, 1919. The engineer's preliminary estimate was $7,800.00, the contractor's bid, $5,292.52.

No work has yet been done.

Highway at Rockaway Point, L. I.

Under chapter 130, Laws of 1917, a concrete highway was constructed adjacent to Fort Tilden, Rockaway Point, L. I.

The contract was awarded to the Rosoff Engineering Co., Inc., of New York city, for $44,126.25, which was subsequently increased to $46,126.25 under a supplementary agreement providing for extending the pavement across the property of the U. S. Coast Guard. The work on this road was started the first of July, 1918, and completed in October, 1918. The final account was $45,989.95.

H. W. Hale, Assistant Engineer, was in charge.

Repairs to Landing and North Piers, Hoffman Island, State Quarantine Station

In connection with repairs to the landing pier and to the north pier, Hoffman Island, State Quarantine Station, two contracts were supervised by this Department, for the Health Officer of the Port of New York. The work on the landing pier was done during the previous year, but the final account was computed during the current year.

The landing pier was repaired under a contract let January 3, 1918, to A. M. Hazell, Inc., of New York city, for $3,387.00. Under an extra work order dated May 21, 1918, the extent of the repairs was increased, for which payment was to be made on a basis of cost plus 15 per cent. The work was started early in April, 1918, and completed on June 19, 1919. The final account for the original contract was $4,152.00 and for the extra work, $3,047.61.

The north pier was repaired under a contract let June 26, 1918, to Anderson and Wheeler, Inc., of New York city, on a basis of cost plus 10 per cent. The extent of the work contemplated was subsequently extended and the additional work was done under an extra work order dated August 9, 1918, on a basis of cost plus 10 per cent. The final account of the original contract was $4,562.02 and for the extra work, $4,354.44.

L. T. Howard, Assistant Engineer, was in charge.

Repairs to Sea-walls between East Marion and Orient, L. I.

Under chapter 428, Laws of 1918, general repairs were made to two existing sea-walls for retaining a highway connecting the vil-

lages of East Marion and Orient, town of Southold, Suffolk county. The contract was let to the Rosoff Engineering Co., Inc., of New York city on October 14, 1918, at a bid price of $8,858.50. Work was started on October 24 and completed on December 4, 1918. The final account was $8,818.81.

H. W. Hale, Assistant Engineer, was in charge.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE EASTERN DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED JUNE 30, 1919.

Ordinary Repairs to Canals — Erie Canal

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Travel	Total
L. C. Hulburd	Senior assistant engineer	$3,540 per year	$1,239 00	$100 31	$1,339 31
R. S. Greenman	Senior assistant engineer	3,300 per year	2,365 00	39 72	2,404 72
T. L. Watkins	Assistant engineer	2,580 per year	473 00	....	473 00
C. D. Burrus	Junior assistant engineer	1,800 per year	235 71	....	235 71
Parkes D. Wendell	Estimate clerk	3,000 per year	1,100 00	....	1,100 00
Hattie A. Dell	Stenographer	1,200 per year	880 00	....	880 00
			$6,292 71	$140 03	$6,432 74
Incidental Expenses					
Stationery and printing				$17 65	
Miscellaneous				126 85	144 50
Total					$6,577 24

Ordinary Repairs to Canals — Champlain Canal

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Travel	Total
L. C. Hulburd	Senior assistant engineer	$3,540 per year	$619 50	$84 05	$703 55
R. S. Greenman	Senior assistant engineer	3,300 per year	1,182 50	11 41	1,193 91
T. L. Watkins	Assistant engineer	2,580 per year	172 79	....	172 79
C. D. Burrus	Junior assistant engineer	1,800 per year	82 50	....	82 50
Parkes D. Wendell	Estimate clerk	3,000 per year	550 00	....	550 00
Hattie A. Dell	Stenographer	1,200 per year	440 00	....	440 00
			$3,047 29	$95 46	$3,142 75
Incidental Expenses					
Stationery and printing				$6 95	
Postage				4 27	
Miscellaneous				268 79	
					280 01
Total					$3,422 76

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Head Office Account

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
D B. La Du	Special deputy state engineer	$7,000 per year	$291 67	....	$291 67
F. P. Williams	Special deputy state engineer	7,000 per year	1,750 04	$167 76	1,917 80
W. B. Landreth	Deputy state engineer	5,000 per year	....	29 34	29 34
H. C. Allen	Consulting engineer	60 00 per day	720 00	101 26	821 26
Henry Goldmark	Consulting engineer	60 00 per day	720 00	156 97	876 97
E E. Haskell	Consulting engineer	60 00 per day	600 00	119 06	719 06
W. B. Landreth	Consulting engineer	6,000 per year	3,301 62	120 77	3,422 39
E. C. Moore	Consulting engineer	60 00 per day	720 00	88 07	808 07
C. H. Paul	Consulting engineer	100 00 per day	1,400 00	155 07	1,555 07
Joseph Ripley	Consulting engineer	7,200 per year	406 45	....	406 45
R. E. Phillips	Engineer of claims	4,800 per year	4,542 50	874 66	5,417 16
Fred J. Wagner	Engineering expert	4,000 per year	591 39	250 88	842 27
C. C. Egbert	Expert in electrical design	20 00 per day	40 00	9 50	49 50
H. D. Alexander	Senior assistant engineer	3,540 per year	1,298 00	118 94	1,416 94
D. H. Daley	Senior assistant engineer	3,300 per year	3,164 77	25 57	3,190 34
R S. Greenman	Senior assistant engineer	3,300 per year	....	856 72	856 72
C. H. MacCulloch	Senior assistant engineer	3,540 per year	2,315 60	23 11	2,338 71
J. M. C. Quarles de Quarles	Senior assistant engineer	3,300 per year	3,300 50	....	3,300 50
G. G. Underhill	Senior assistant engineer	3,540 per year	3,558 50	383 85	3,942 35
N. E. Whitford	Senior assistant engineer	3,300 per year	3,547 50	213 98	3,761 48
C H. Wood	Senior assistant engineer	3,300 per year	241 59	....	241 59
G. W. Codwise	Confidential assistant	4,400 per year	780 64	113 90	894 54
Fred J. Wagner	Confidential assistant	4,000 per year	1,208 23	174 61	1,382 84
L. D. McCormac	Private secretary	2,400 per year	....	178 16	178 16
C. R. Waters	Private secretary	2,340 per year	....	10 98	10 98
J J. Allen	Canal clerk	1,800 per year	1,935 00	....	1,935 00
C. B. Dunham, Jr	Clerk	2,400 per year	2,425 62	....	2,425 62
J. T. Gorman	Clerk	1,980 per year	1,943 25	138 58	2,081 83
J. C. Guffin	Clerk	1,800 per year	1,749 75	....	1,749 75
J. E. F. Minnock	Clerk	1,980 per year	1,943 25	....	1,943 25
G. T. Waterman	Clerk	1,200 per year	1,210 00	....	1,210 00
W. E. Brower	Messenger	720 per year	353 24	....	353 24
F. J. Murphy	Page	480 per year	90 93	....	90 93
Mary Broughton	Stenographer	900 per year	940 50	....	940 50
Nelle Clark	Stenographer	1,200 per year	1,320 00	....	1,320 00
W. L. Collins	Stenographer	1,200 per year	550 00	....	550 00
Agnes Fogerty	Stenographer	1,200 per year	1,320 00	....	1,320 00
Mary G. Harrington	Stenographer	1,200 per year	933 23	....	933 23
Grace Haswell	Stenographer	1,350 per year	1,485 00	....	1,485 00
Anna W. Newton	Stenographer	1,350 per year	1,485 00	....	1,485 00
J. J Tobin	Stenographer	1,800 per year	897 63	....	897 63
Jessie J. Weller	Stenographer	900 per year	781 00	....	781 00
T S. Bailey	Assistant engineer	2,580 per year	2,537 00	....	2,537 00
J. C. Bell	Assistant engineer	2,580 per year	55 48	....	55 48
H. W. Benedict	Assistant engineer	2,580 per year	631 55	....	631 55
F. E. Blake	Assistant engineer	2,580 per year	1,710 87	....	1,710 87
H. E. Brainard	Assistant engineer	2,580 per year	49 00	....	49 00
Clark Brown	Assistant engineer	2,208 per year	2,171 20	....	2,171 20
N. E. Cottrell	Assistant engineer	1,980 per year	735 05	....	735 05
C. R. De Graff	Assistant engineer	2,580 per year	185 82	6 88	192 70
G. E. Gibson	Assistant engineer	2,580 per year	1,655 50	....	1,655 50
M. W. Grimes	Assistant engineer	2,160 per year	2,124 00	160 74	2,284 74
F. B. Hall	Assistant engineer	2,580 per year	1,695 64	18 10	1,713 74
F. W. Harris	Assistant engineer	2,580 per year	91 55	....	91 55
A. G. Hayden	Assistant engineer	2,580 per year	403 88	....	403 88
T. R. Haselum	Assistant engineer	2,160 per year	181 50	....	181 50
G. D. Kellogg	Assistant engineer	2,580 per year	862 77	....	862 77
H. C. Kline	Assistant engineer	2,580 per year	126 70	....	126 70
J. B. Maguire	Assistant engineer	2,340 per year	1,527 61	14 02	1,541 63
W. S. McDowell	Assistant engineer	2,580 per year	1,453 57	....	1,453 57
R. H. Merrill	Assistant engineer	2,580 per year	374 52	....	374 52
C. W. Morris, Jr	Assistant engineer	2,160 per year	1,071 57	....	1,071 57
J. T. Murphy	Assistant engineer	2,340 per year	856 70	....	856 70
E. P. Neuschwander	Assistant engineer	2,580 per year	2,773 50	99 89	2,873 39
J. A. O'Donnell	Assistant engineer	2,160 per year	2,002 64	....	2,002 64
C. E. Quimby	Assistant engineer	2,160 per year	270 60	....	270 60
E. G. Raynor	Assistant engineer	2,580 per year	187 26	....	187 26

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Head Office Account — (Continued)

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
L. S. Rickard	Assistant engineer	$2,160 per year	$1,334 55		$1,334 55
H. J. Scheuermann	Assistant engineer	2,580 per year	1,318 74	$10 28	1,329 02
E. G. Semon	Assistant engineer	2,340 per year	125 81		125 81
H. S. Sparr	Assistant engineer	2,160 per year	2,124 00		2,124 00
S. R. Tighe	Assistant engineer	1,980 per year	209 00		209 00
C. R. Waters	Assistant engineer	2,340 per year	463 56		463 56
T. L. Watkins	Assistant engineer	2,580 per year		17 45	17 45
L. C. West	Assistant engineer	2,580 per year	239 41	19 62	259 03
J. M. Angus	Junior assistant engineer	1,800 per year	486 13		486 13
Leroy Barner	Junior assistant engineer	1,560 per year	41 52		41 52
J. F. Blaise	Junior assistant engineer	1,800 per year	132 50		132 50
C. D. Burrus	Junior assistant engineer	1,800 per year	945 00		945 00
H. F. Eagan	Junior assistant engineer	1,800 per year	163 94		163 94
B. Gazier	Junior assistant engineer	1,320 per year	121 00		121 00
C. J. Grace, Jr	Junior assistant engineer	1,200 per year	241 29		241 29
A. E. Green	Junior assistant engineer	1,800 per year	312 79		312 79
J. S. Heath	Junior assistant engineer	1,320 per year	565 97		565 97
W. J. Henk	Junior assistant engineer	1,800 per year	1,643 28		1,643 28
J. S. Hyman	Junior assistant engineer	1,800 per year	377 13		377 13
G. B. Kelley	Junior assistant engineer	1,800 per year	1,811 50		1,811 50
C. T. Kniskern	Junior assistant engineer	1,800 per year	945 00		945 00
Jacob Labishiner	Junior assistant engineer	1,320 per year	335 50		335 50
G. D. Meer	Junior assistant engineer	1,800 per year	1,852 50	51 34	1,903 84
Charles Messina	Junior assistant engineer	1,560 per year	66 73		66 73
P. R. Murray	Junior assistant engineer	1,800 per year	1,935 00		1,935 00
Mott Palmer	Junior assistant engineer	1,800 per year	15 97		15 97
G. L. Schillner	Junior assistant engineer	1,800 per year	1,151 50		1,151 50
Paul Scully	Junior assistant engineer	1,320 per year	1,243 96		1,243 96
R. B. Smith	Junior assistant engineer	1,800 per year	1,245 54		1,245 54
G. G. Sweet	Junior assistant engineer	1,560 per year	1,534 00		1,534 00
L. E. Turpit	Junior assistant engineer	1,560 per year	449 33		449 33
Frank Van Zile	Junior assistant engineer	1,680 per year	1,421 07		1,421 07
L. B. Westfall	Junior assistant engineer	1,800 per year	1,892 42	21 88	1,914 30
C. P. Wiweke	Junior assistant engineer	1,800 per year	772 38		772 38
M. E. Baker	Engineering assistant	1,080 per year	1,171 50		1,171 50
J. F. Duffy	Engineering assistant	1,080 per year	807 96		807 96
A. E. Halligan	Engineering assistant	1,080 per year	306 05		306 05
C. L. Hawkins	Engineering assistant	960 per year	136 96		136 96
William Leffler	Engineering assistant	960 per year	330 00		330 00
C. W. Wood	Engineering assistant	840 per year	35 93		35 93
E. V. Allendorph	Inspector of engineering works	1,560 per year	1,677 00		1,677 00
M. S. Bierce	Inspector of engineering works	1,560 per year	1,534 00		1,534 00
F. B. Kraft	Inspector of engineering works	1,560 per year	1,677 00		1,677 00
E. H. Wetsel	Inspector of engineering works	1,560 per year	1,677 00		1,677 00
J. Ellis Hurrle	Boatman	3 00 per day	359 70	19 71	379 41
W. J. Atkinson	Laborer	2 50 per day	1,003 75		1,003 75
John Cullen	Laborer	2 50 per day	860 75		860 75
James Daly	Laborer	2 50 per day	264 00		264 00
John Dooley	Laborer	2 50 per day	792 00		792 00
William Felstead	Laborer	2 50 per day	860 75		860 75
Joseph Habbinger	Laborer	2 50 per day	816 75		816 75
David Horner	Laborer	2 50 per day	896 50		896 50
J. M. Macdonald	Laborer	2 50 per day	860 75		860 75
G. F. Marcoux	Laborer	2 50 per day	41 25		41 25
Filadelfo Mondello	Laborer	2 50 per day	860 75		860 75
T. Rattoone	Laborer	2 50 per day	811 25		811 25
J. W. Shook	Laborer	2 50 per day	126 50		126 50
W. J. Smith	Laborer	2 50 per day	1,003 75		1,003 75
H. J. Soule	Laborer	2 50 per day	860 75		860 75
Henry Strobel	Laborer	2 50 per day	860 75		860 75
M. J. Tanner	Laborer	2 50 per day	863 50		863 50
J. R. Van Schoonhoven	Laborer	2 50 per day	860 75		860 75
E. Van Truen	Laborer	2 50 per day	860 75		860 75
F. E. Davis	Chauffeur	1,650 per year	1,031 25	49 23	1,080 48
J. J. Finn	Chauffeur	1,650 per year	886 84	47 30	934 14
H. W. Nutter	Chauffeur	1,650 per year	1,773 75	96 35	1,870 10
F. M. Hill	Title maker	1,560 per year	1,534 00		1,534 00
E. M. Chamberlain	Night watchman	960 per year	172 00		172 00

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Head Office Account — (Concluded)

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
Theresa M. Stubbing	Telephone operator	$840 per year	$924 00		$924 00
Catherine Ryan	Charwoman	480 per year	528 00		528 00
Lybrand, Ross Bros. & Montgomery	Public accountants		37,828 59	$7,696 63	45,525 22
			$177,012 68	$12,641 16	$189,653 84
Incidental Expenses					
Instruments, tools and appliances				$920 89	
Office rent				3,643 27	
Fuel and light				45 84	
Stationery and printing				3,949 10	
Postage				1,544 56	
Telephone and telegraph				1,860 54	
Miscellaneous				11,348 75	
					23,312 95
Total					$212,966 79

Construction of Barge Canal — Erie Canal

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
E. A. Lamb	Senior assistant engineer	$3,300 per year	$3,245 00	$412 35	$3,657 35
A. E. Steere	Senior assistant engineer	3,300 per year	39 03	43 41	82 44
Parkes D. Wendell	Estimate clerk	3,000 per year	1,575 00		1,575 00
G. P. Gleason	Stenographer to division engineer	2,100 per year	927 50		927 50
Edna M. Pickert	Stenographer	1,200 per year	1,210 00		1,210 00
M. J. Sullivan	Stenographer	1,200 per year	1,320 00		1,320 00
C. A. Curtis	Assistant engineer	2,580 per year		32 95	32 95
C. R. De Graff	Assistant engineer	2,580 per year	714 41		714 41
G. A. Ensign	Assistant engineer	2,160 per year	893 89	130 00	1,023 89
R. D. Hayes	Assistant engineer	2,580 per year		13 05	13 05
M. E. James	Assistant engineer	2,580 per year	2,773 50	996 34	3,769 84
B. T. Kenyon	Assistant engineer	2,580 per year	353 25	29 77	383 02
T. J. Looney	Assistant engineer	1,980 per year	961 56		961 56
A. P. Mussi	Assistant engineer	2,340 per year	1,290 01	719 69	2,009 70
C. G. Ranney	Assistant engineer	2,580 per year	2,773 50	314 79	3,088 29
T. L. Watkins	Assistant engineer	2,580 per year	1,203 21		1,203 21
Leroy Bailey	Junior assistant engineer	1,200 per year	638 71		638 71
A. H. Charchian	Junior assistant engineer	1,320 per year	626 74		626 74
E. F. Dossert	Junior assistant engineer	1,680 per year	27 10		27 10
H. F. Eagan	Junior assistant engineer	1,800 per year	774 96		774 96
F. B. Gifford	Junior assistant engineer	1,440 per year	810 45		810 45
F. E. Gillen	Junior assistant engineer	1,800 per year	1,849 66		1,849 66
W. M. Griffith	Junior assistant engineer	1,800 per year	1,935 00	395 42	2,330 42
H. W. Jewell	Junior assistant engineer	1,800 per year	1,312 52	346 18	1,658 70
C. T. McLean	Junior assistant engineer	1,440 per year	517 96		517 96
William Mangan	Junior assistant engineer	1,560 per year	983 93		983 93
M. J. Quinn	Junior assistant engineer	1,440 per year	798 48	96 41	894 89
R. B. Smith	Junior assistant engineer	1,800 per year	460 58		460 58
C. E. Vedder	Junior assistant engineer	1,440 per year	304 50		304 50
C. A. Wilbur	Junior assistant engineer	1,800 per year	1,274 35	190 85	1,465 20
F. S. Belotti	Engineering assistant	1,080 per year	1,073 03		1,073 03
E. E. Fobes	Engineering assistant	840 per year	76 25		76 25
D. A. Gillette	Engineering assistant	840 per year	179 66		179 66
George Hinds	Engineering assistant	840 per year	89 42		89 42
J. C. Quinterro	Engineering assistant	900 per year	685 69		685 69

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Erie Canal — (Continued)

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
F. B. Stoddard	Engineering assistant	$1,080 per year	$710 14		$710 14
C. B. Tebo	Engineering assistant	1,080 per year	1,168 20		1,168 20
T. M. Oliver	Inspector of engineering works	1,560 per year	1,529 39		1,529 39
Raymond Comrie	Boatman	3 00 per day	660 00		660 00
Harold Folmsbee	Boatman	3 00 per day	1,023 00		1,023 00
H. D. Horning	Boatman	3 00 per day	108 90		108 90
A. B. Starin	Boatman	3 00 per day	1,065 90		1,065 90
H. L. Crouse	Laborer	2 50 per day	495 00		495 00
Thomas Dalton	Laborer	2 50 per day	52 25		52 25
William De Forest	Laborer	2 50 per day	514 25		514 25
R. N. Kay	Laborer	2 50 per day	19 25		19 25
John Lavery	Laborer	2 50 per day	85 25		85 25
T. F. Madden	Laborer	2 50 per day	940 50		940 50
M. Metz	Laborer	2 50 per day	567 87		567 87
P. Sajta	Laborer	2 50 per day	522 50		522 50
H. J. Richardson	Photographer	1,680 per year	1,008 00	$43 27	1,051 27
Harry Bishton	Gage reader	14 00 per month	154 00		154 00
Guy Bracebridge	Gage reader	5 00 per month	55 00		55 00
Carlton Cornwell	Gage reader	7 00 per month	35 00		35 00
Forrest Devle	Gage reader	7 00 per month	63 00		63 00
H. C. Dowling	Gage reader	7 00 per month	77 00		77 00
P. C. Earl	Gage reader	7 00 per month	84 00		84 00
L. E. Jeffords	Gage reader	10 00 per month	36 13		36 13
Lloyd Kast	Gage reader	7 00 per month	84 00		84 00
Richard Kilmartin	Gage reader	7 00 per month	84 00		84 00
Clark Kyser	Gage reader	7 00 per month	77 00		77 00
Peter Lebeis	Gage reader	7 00 per month	56 00		56 00
Oscar Lockwood	Gage reader	7 00 per month	84 00		84 00
C. F. Loring	Gage reader	7 00 per month	14 00		14 00
James Murphy	Gage reader	9 00 per month	18 00		18 00
Rose Murphy	Gage reader	9 00 per month	45 00		45 00
Fred Pentland	Gage reader	9 00 per month	55 16		55 16
P. C. Pickard	Gage reader	7 00 per month	49 00		49 00
Antoine Plouffe	Gage reader	9 00 per month	36 00		36 00
J. Reepmeyer	Gage reader	10 00 per month	120 00		120 00
William Reihl	Gage reader	9 00 per month	52 84		52 84
A. W. Spencer	Gage reader	7 00 per month	49 00		49 00
Minnie E. White	Gage reader	7 00 per month	42 00		42 00
Robert Wilson	Gage reader	10 00 per month	10 00		10 00
C. E. Wing	Gage reader	10 00 per month	110 00		110 00
C. W. Young	Gage reader	14 00 per month	140 00		140 00
			$45,799 38	$3,764 48	$49,563 86

Incidental Expenses

Office rent	$1,030 00	
Fuel and light	141 17	
Stationery and printing	9 78	
Postage	79 69	
Telephone and telegraph	408 86	
Miscellaneous	1,003 54	
		2,673 04
Total		$52,236 90

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Champlain Canal

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
John Schade	Cashier	$2,100 per year	$2,195 10		$2,195 10
J. E. Phinney	Stenographer	1,320 per year	1,452 00		1,452 00
C. A. Curtis	Assistant engineer	2,580 per year	2,270 68	$735 20	3,005 88
J. B. Foote	Assistant engineer	2,340 per year	2,301 00	1,114 73	3,415 73
R. G. Gibson	Assistant engineer	2,160 per year	1,704 00	7 85	1,711 85
F. W. Harris	Assistant engineer	2,580 per year	1,327 45		1,327 45
R. D. Hayes	Assistant engineer	2,580 per year	2,773 50	1,151 39	3,924 89
Harold Bristol	Junior assistant engineer	1,200 per year	1,320 00		1,320 00
D. E. Damon	Junior assistant engineer	1,800 per year	1,935 00		1,935 00
G. E. Deutschbein	Junior assistant engineer	1,800 per year	1,935 00	83 65	2,018 65
Mott Palmer	Junior assistant engineer	1,800 per year	1,280 00	42 20	1,322 20
J. P. Walsh	Junior assistant engineer	1,680 per year	1,592 62		1,592 62
G. A. Rogers	Engineering assistant	1,080 per year	22 35		22 35
Thomas Ryan, Jr.	Engineering assistant	1,080 per year	95 61		95 61
J. C. Leyland	Boatman	3 00 per day	42 90		42 90
G. E. McElroy	Boatman	3 00 per day	283 80		283 80
N. H. McHerd	Boatman	3 00 per day	1,204 50		1,204 50
Harry McMahon	Boatman	3 00 per day	435 60		435 60
Ephraim Newland	Boatman	3 00 per day	521 40		521 40
Edward Ryan	Boatman	3 00 per day	528 00		528 00
F. H. Crandall	Laborer	2 50 per day	847 00		847 00
B. K. Ellis	Laborer	2 50 per day	871 20		871 20
F. J. Hilfinger	Laborer	2 50 per day	220 00		220 00
J. F. Malin	Laborer	2 50 per day	506 00		506 00
L. Saunders	Laborer	2 50 per day	126 50		126 50
H. J. Richardson	Photographer	1,680 per year	560 00	57 41	617 41
B. H. Bennett	Gage reader	7 00 per month	3 50		3 50
E. H. Bowker	Gage reader	7 00 per month	49 00		49 00
Charles Cheney	Gage reader	7 00 per month	7 00		7 00
J. H. Donnelly	Gage reader	7 00 per month	84 00		84 00
W. B. Dunstan	Gage reader	7 00 per month	87 50		87 50
G. E. Fifield	Gage reader	7 00 per month	84 00		84 00
A. B. Fisher	Gage reader	7 00 per month	56 00		56 00
C. F. Mayhew	Gage reader	8 00 per month	88 00		88 00
J. T. Morris	Gage reader	8 00 per month	88 00		88 00
Henry Palmer	Gage reader	7 00 per month	77 00		77 00
Byron Stedman	Gage reader	7 00 per month	10 38		10 38
F. N. Wells	Gage reader	7 00 per month	21 00		21 00
			$29,006 59	$3,192 43	$32,199 02
	Incidental Expenses				
Office rent				$574 00	
Fuel and light				102 22	
Stationery and printing				11 44	
Postage				129 32	
Telephone and telegraph				246 37	
Miscellaneous				753 39	
					1,816 74
Total					$34,015 76

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal Terminals

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
D. B. La Du	Special deputy state engineer	$7,000 per year	$291 66	$4 00	$295 66
F. P. Williams	Special deputy state engineer	7,000 per year	1,749 96	211 07	1,961 03
H. D. Alexander	Senior assistant engineer	3,540 per year	649 00	....	649 00
Edward Anderberg	Senior assistant engineer	3,540 per year	2,729 26	88 94	2,818 20
A. W. Conner	Senior assistant engineer	3,300 per year	3,300 50	75 03	3,375 53
C. H. MacCulloch	Senior assistant engineer	3,540 per year	1,489 90	115 46	1,605 36
C. H. Wood	Senior assistant engineer	3,300 per year	2,458 86	70 86	2,529 72
W. B. Landreth	Consulting engineer	6,000 per year	35 48	74 05	109 53
E. P. Goodrich	Expert on terminal construction	40 00 per day	120 00	23 74	143 74
H. McL. Harding	Expert on terminal construction	40 00 per day	40 00	27 05	67 05
M. W. Williams	Expert on terminal construction	40 00 per day	1,000 00	139 41	1,139 41
F. J. Wagner	Confidential assistant	4,000 per year	....	95 61	95 61
F. J. Wagner	Engineering expert	4,000 per year	1,100 00	184 18	1,284 18
C. R. Waters	Private secretary	2,340 per year	....	98 41	98 41
L. D. McCormac	Private secretary	2,400 per year	....	122 40	122 40
W. S. Ryan	Confidential clerk and stenographer	2,400 per year	....	30 45	30 45
Fred C. Stahl	Bookkeeper	1,800 per year	325 97	....	325 97
James E. Stewart	Clerk	1,980 per year	1,778 25	....	1,778 25
G. P. Gleason	Stenographer to division engineer	2,100 per year	1,330 00	....	1,330 00
Emily P Hofmann	Stenographer	900 per year	863 50	....	863 50
S. R. Bellows	Assistant engineer	2,580 per year	90 16	....	90 16
H. W. Benedict	Assistant engineer	2,580 per year	214 50	....	214 50
F. E. Blake	Assistant engineer	2,580 per year	1,062 63	....	1,062 63
W. C. Bratton	Assistant engineer	2,580 per year	2,773 50	80 18	2,853 68
P. H. Budd	Assistant engineer	2,208 per year	808 29	20	808 49
W. L. Caler	Assistant engineer	2,580 per year	2,773 50	473 44	3,246 94
Horace Corbin	Assistant engineer	2,580 per year	2,626 97	2 97	2,629 94
N. E. Cottrell	Assistant engineer	1,980 per year	1,393 45	....	1,393 45
C. A. Curtis	Assistant engineer	2,580 per year	130 39	53 28	183 67
J. B. Doughty	Assistant engineer	2,340 per year	2,330 25	54 15	2,384 40
G A. Ensign	Assistant engineer	2,160 per year	351 91	....	351 91
Ely Gamse	Assistant engineer	2,580 per year	2,773 50	99 31	2,872 81
R. G. Gibson	Assistant engineer	2,160 per year	24 00	12 58	36 58
H. W. Hale	Assistant engineer	2,580 per year	1,353 85	105 56	1,459 41
F. B. Hall	Assistant engineer	2,580 per year	816 30	31 55	847 85
F W. Harris	Assistant engineer	2,580 per year	473 00	30 33	503 33
A. G. Hayden	Assistant engineer	2,580 per year	2,133 12	....	2,133 12
R. D. Hayes	Assistant engineer	2,580 per year	236 50	9 50	246 00
L. T. Howard	Assistant engineer	2,580 per year	2,556 84	106 28	2,663 12
G. D. Kellogg	Assistant engineer	2,580 per year	157 67	....	157 67
H. C. Kline	Assistant engineer	2,580 per year	610 32	31 62	641 94
F. T. Lawton	Assistant engineer	2,580 per year	2,526 50	62 55	2,589 05
T. J. Loonie	Assistant engineer	1,980 per year	647 02	....	647 02
W. S. McDowel	Assistant engineer	2,580 per year	277 18	....	277 18
J. B. Maguire	Assistant engineer	2,340 per year	773 39	....	773 39
C W Morris, Jr	Assistant engineer	2,160 per year	1,052 43	....	1,052 43
A. P. Mussi	Assistant engineer	2,340 per year	1,225 49	111 45	1,336 94
E. C. Olcott	Assistant engineer	2,208 per year	2,157 92	....	2,157 92
C E. Quimby	Assistant engineer	2,160 per year	1,698 41	....	1,698 41
E. G. Raynor	Assistant engineer	2,580 per year	1,106 21	....	1,106 21
A C. Richards	Assistant engineer	2,580 per year	2,773 50	....	2,773 50
H. J. Scheuermann	Assistant engineer	2,580 per year	1,454 76	2 50	1,457 26
Rupert Sturtevant	Assistant engineer	2,580 per year	2,422 56	194 72	2,617 28
S. R. Tighe	Assistant engineer	1,980 per year	165 00	....	165 00
C. R. Waters	Assistant engineer	2,340 per year	607 20	....	607 20
T. L. Watkins	Assistant engineer	2,580 per year	924 50	28 97	953 47
L. C. West	Assistant engineer	2,580 per year	2,287 09	....	2,287 09
J. M. Angus	Junior assistant engineer	1,800 per year	546 45	....	546 45
H. T. Arnold	Junior assistant engineer	1,800 per year	1,706 82	....	1,706 82
J. F. Blaise	Junior assistant engineer	1,800 per year	1,637 50	....	1,637 50
J. J. Carroll	Junior assistant engineer	1,440 per year	39 03	....	39 03
A. H. Charchian	Junior assistant engineer	1,320 per year	72 80	....	72 80
J. A. Daley	Junior assistant engineer	1,440 per year	1,454 00	....	1,454 00
L. A. Denner	Junior assistant engineer	1,440 per year	11 61	....	11 61
John Edelstein	Junior assistant engineer	1,680 per year	1,621 21	....	1,621 21
B. Gazier	Junior assistant engineer	1,320 per year	1,163 16	....	1,163 16
A. E. Green	Junior assistant engineer	1,800 per year	167 84	....	167 84
Leroy Greenalch	Junior assistant engineer	1,800 per year	373 82	....	373 82

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal Terminals — (Continued)

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
J. E. Hall	Junior assistant engineer	$1,800 per year	$1,935 00		$1,935 00
J. S. Heath	Junior assistant engineer	1,320 per year	765 03		765 03
H. W. Henderson	Junior assistant engineer	1,440 per year	70 83		70 83
W. J. Henk	Junior assistant engineer	1,800 per year	168 22		168 22
J. A. Husband	Junior assistant engineer	1,320 per year	318 88		318 88
J. S. Hyman	Junior assistant engineer	1,800 per year	214 51		214 51
Samuel Jaffe	Junior assistant engineer	1,200 per year	275 00		275 00
H. W. Jewell	Junior assistant engineer	1,800 per year	409 75	$59 28	469 03
H. Kabak	Junior assistant engineer	1,320 per year	1,075 34		1,075 34
C. F. Keale, Jr	Junior assistant engineer	1,440 per year	503 97		503 97
H. C. Kelly	Junior assistant engineer	1,680 per year	47 67		47 67
S. Levine	Junior assistant engineer	1,800 per year	657 45		657 45
William Mangan	Junior assistant engineer	1,560 per year	119 91		119 91
Charles Messina	Junior assistant engineer	1,560 per year	47 67		47 67
Charles Montag	Junior assistant engineer	1,800 per year	384 64		384 64
D. C. Ogsbury	Junior assistant engineer	1,800 per year	1,935 00		1,935 00
Mott Palmer	Junior assistant engineer	1,800 per year	10 00	10 80	20 80
M. J. Quinn	Junior assistant engineer	1,440 per year		13 00	13 00
G. L. Schillner	Junior assistant engineer	1,800 per year	660 00		660 00
Isie Spahn	Junior assistant engineer	1,320 per year	1,111 81		1,111 81
Isaac Stern	Junior assistant engineer	1,440 per year	1,402 74		1,402 74
L. E. Turpit	Junior assistant engineer	1,560 per year	250 00		250 00
F. M. Van Zile	Junior assistant engineer	1,680 per year	230 93		230 93
C. A. Wilbur	Junior assistant engineer	1,800 per year	64 52		64 52
C. P. Wiweke	Junior assistant engineer	1,800 per year	1,162 62		1,162 62
F. S. Belotti	Engineering assistant	1,080 per year	15 97		15 97
J. F. Duffy	Engineering assistant	1,080 per year	332 14		332 14
W. R. Gloek	Engineering assistant	900 per year	209 00		209 00
A. E. Halligan	Engineering assistant	1,080 per year	881 95		881 95
A. Heckman, Jr	Engineering assistant	840 per year	161 52		161 52
G. Hinds	Engineering assistant	840 per year	4 97		4 97
Joseph Hoehlin	Engineering assistant	840 per year	278 11		278 11
William Leffler	Engineering assistant	960 per year	118 87		118 87
G. W. Nostrand	Engineering assistant	900 per year	336 16		336 16
J. C. Quinterro	Engineering assistant	900 per year	73 31		73 31
J. J. Raup	Engineering assistant	1,080 per year	1,178 42		1,178 42
G. A. Rogers	Engineering assistant	1,080 per year	198 00		198 00
F. B. Stoddard	Engineering assistant	1,080 per year	477 86		477 86
E. A. Terrell	Engineering assistant	840 per year	46 20		46 20
George Terwilliger	Engineering assistant	1,080 per year	1,188 00		1,188 00
T. J. Torpy, Jr	Engineering assistant	900 per year	43 63		43 63
W. H. H. Klinkhart	Inspector of engineering works	1,560 per year	1,677 00		1,677 00
H. Kramer	Inspector of engineering works	1,560 per year	1,677 00		1,677 00
T. M. Oliver	Inspector of engineering works	1,560 per year	4 61		4 61
George Alexander	Boatman	3 00 per day	224 40		224 40
A. A. Boles	Boatman	3 00 per day	1,197 90		1,197 90
Louis Cicio	Boatman	3 00 per day	709 50		709 50
Raymond Comrie	Boatman	3 00 per day	151 80		151 80
Walter Cormany	Boatman	3 00 per day	1,204 50		1,204 50
B. K. Ellis	Boatman	3 00 per day	52 80		52 80
P. F. Fitzgerald	Boatman	3 00 per day	1,042 80		1,042 80
Harold Folmsbee	Boatman	3 00 per day	9 90		9 90
H. D. Horning	Boatman	3 00 per day	429 00		429 00
J. A. Jacobson	Boatman	3 00 per day	1,059 30		1,059 30
J. J. Kelly	Boatman	3 00 per day	1,062 60		1,062 60
Giles D. Long	Boatman	3 00 per day	128 70		128 70
Harry McMahon	Boatman	3 00 per day	3 30		3 30
Ephraim Newland	Boatman	3 00 per day	3 30		3 30
E. W. Reilly	Boatman	3 00 per day	1,204 50		1,204 50
George Reuling	Boatman	3 00 per day	554 40		554 40
W. B. Rowland	Boatman	3 00 per day	844 80		844 80
M. J. Sims	Boatman	3 00 per day	1,194 60		1,194 60
J. W. Turner	Boatman	3 00 per day	89 10		89 10
H. L. Crouse	Laborer	2 50 per day	11 00		11 00
William De Forest	Laborer	2 50 per day	13 75		13 75
Charles Girard	Laborer	2 50 per day	992 75		992 75
James Hopkins	Laborer	2 50 per day	893 75		893 75
John Lavery	Laborer	2 50 per day	154 00		154 00
Henry Macfarlane	Laborer	2 50 per day		15 40	15 40

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal Terminals — (Concluded)

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
T. F. Madden	Laborer	$2 50 per day	$63 25		$63 25
G. L. Reuling	Laborer	2 50 per day	151 25		151 25
Paul Sajta	Laborer	2 50 per day	8 25		8 25
Lewis Saunders	Laborer	2 50 per day	2 75		2 75
John W. Shook	Laborer	2 50 per day	41 25		41 25
Gilbert Venter	Laborer	2 50 per day	1,003 75		1,003 75
H. J. Richardson	Photographer	1,680 per year	238 00	$132 38	370 38
F. E. Davis	Chauffeur	1,650 per year	742 50	352 26	1,094 76
J. J. Finn	Chauffeur	1,650 per year	886 91	282 32	1,169 23
H. W. Nutter	Chauffeur	1,650 per year		220 58	220 58
Lybrand, Ross Bros. & Montgomery	Public accountants		18,363 01	3,304 72	21,667 73
			$133,303 97	$7,242 54	$140,546 51

Incidental Expenses

Instruments, tools and appliances	$46 53	
Office rent	4,874 97	
Fuel and light	190 59	
Stationery and printing	2,435 16	
Postage	125 61	
Telephone and telegraph	621 12	
Miscellaneous	6,851 29	
		15,145 27
Total		$155,691 78

Hudson River Terminals

Chapter 555, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Travel	Total
W. B. Landreth	Consulting engineer	$6,000 per year	$35 48	$18 82	$54 30
G. W. Codwise	Confidential assistant	4,400 per year		3 18	3 18
B. F Cresson, Jr.	Expert on terminal construction	40 00 per day	160 00	20 52	180 52
E. P. Goodrich	Expert on terminal construction	40 00 per day	160 00	22 55	182 55
H. McL. Harding	Expert on terminal construction	40 00 per day	160 00	21 95	181 95
M. W. Williams	Expert on terminal construction	40 00 per day	200 00	42 73	242 73
F. C. Stahl	Bookkeeper	1,800 per year	69 03		69 03
J. C. Bell	Assistant engineer	2,580 per year	2,308 13	719 85	3,027 98
G. D. Kellogg	Assistant engineer	2,580 per year	20 81	62 82	83 63
C. T. Kniskern	Junior assistant engineer	1,800 per year	330 00		330 00
William Leffler	Engineering assistant	960 per year	251 40		251 40
Paul Scully	Junior assistant engineer	1,320 per year	36 30		36 30
James Daly	Laborer	2 50 per day	156 75		156 75
			$3,887 90	$912 42	$4,800 32

Incidental Expenses

Postage	$0 37	
Miscellaneous	15 89	
		16 26
Total		$4,816 58

* Includes additional compensation of 10 per cent allowed above base rate.

Bridge Designers, Engineers, etc.

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
H. E. Brainard	Assistant engineer	$2,580 per year	$1,563 50	$22 01	$1,585 51
W. S. McDowell	Assistant engineer	2,580 per year	236 50	....	236 50
Keuffel & Esser Company				128 83	128 83
Postmaster				49 16	49 16
Total			$1,800 00	$200 00	$2,000 00

High Street Bridge, Cohoes

Chapter 181, Laws of 1917, chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Travel	Total
C. A. Curtis	Assistant engineer	$2,580 per year	$372 43	$104 67	$477 10
J. P. Walsh	Junior assistant engineer	1,680 per year	74 88	....	74 88
B. K. Ellis	Laborer	2 50 per day	33 00	....	33 00
John Lavery	Laborer	2 50 per day	220 00	....	220 00
			$700 31	$104 67	$804 98
Incidental Expenses					
Stationery and printing				$15 68	
Fuel and light				0 32	
					16 00
Total					$820 98

Schenectady–Scotia Bridge

Chapter 735, Laws of 1917; chapter 634, Laws of 1919

NAME	Rank	Rate of compensation	* Services	Travel	Total
B. A. Davis	Consulting engineer	$60 00 per day	$300 00	$33 87	$333 87
E. D. Hendricks	Senior assistant engineer	3,300 per year	419 60	73 04	492 64
C. H. Wood	Senior assistant engineer	3,300 per year	600 05	....	600 05
G. D. Kellogg	Assistant engineer	2,580 per year	267 02	137 64	404 66
W. S. McDowell	Assistant engineer	2,580 per year	118 25	....	118 25
C. E. Quimby	Assistant engineer	2,160 per year	154 99	....	154 99
J. J. Carroll	Junior assistant engineer	1,440 per year	138 61	....	138 61
A. H. Charchian	Junior assistant engineer	1,320 per year	76 11	....	76 11
A. E. Green	Junior assistant engineer	1,800 per year	115 50	....	115 50
L. Greenalch	Junior assistant engineer	1,800 per year	227 63	....	227 63
G. D. Meer	Junior assistant engineer	1,800 per year	82 50	....	82 50
R. B. Smith	Junior assistant engineer	1,800 per year	172 81	14 44	187 25
William Leffler	Engineering assistant	960 per year	95 90	....	95 90
C. B. Tebo	Engineering assistant	1,080 per year	19 80	....	19 80
			$2,788 77	$258 99	$3,047 76
Incidental Expenses					
Miscellaneous					308 26
Total					$3,356 02

* Includes additional compensation of 10 per cent allowed above base rate.

Sea-wall, Orient – East Marion, L. I.

Chapter 428, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
Edward Anderberg	Senior assistant engineer	$3,540 per year	$9 76		$9 76
H. W. Benedict	Assistant engineer	2,580 per year	37 74		37 74
H. W. Hale	Assistant engineer	2,580 per year	113 02	$238 74	351 76
F. B. Hall	Assistant engineer	2,580 per year	69 35		69 35
H. F. Eagan	Junior assistant engineer	1,800 per year	44 71	37 62	82 33
Isie Spahm	Junior assistant engineer	1,320 per year	3 55		3 55
Isaac Stern	Junior assistant engineer	1,440 per year	15 61		15 61
J. J. Kelly	Boatman	3 00 per day	141 90		141 90
Oliver A. Quayle				27 52	27 52
Total			$435 64	$303 88	$739 52

Blue Line Surveys

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Travel	Total
G. W. Codwise	Confidential assistant	$4,400 per year	$1,484 99		$1,484 99
John Schade	Cashier	2,100 per year	62 40		62 40
C. R. De Graff	Assistant engineer	2,580 per year	282 27		282 27
G. A. Ensign	Assistant engineer	2,160 per year	878 20		878 20
T. R. Hazelum	Assistant engineer	2,160 per year	371 25		371 25
Edwin Hilborn	Assistant engineer	2,580 per year	2,633 97	$309 45	2,943 42
O. F. Lewis	Assistant engineer	2,340 per year	1,963 10		1,963 10
T. J. Loomis	Assistant engineer	1,980 per year	338 42		338 42
Leroy Bailey	Junior assistant engineer	1,200 per year	393 87		393 87
A. H. Charchian	Junior assistant engineer	1,320 per year	437 13		437 13
L. W. Douglas	Junior assistant engineer	1,200 per year	36 67		36 67
Roy Engell	Junior assistant engineer	1,440 per year	45 83		45 83
L. E. Fields	Junior assistant engineer	1,440 per year	284 33		284 33
F. B. Gifford	Junior assistant engineer	1,440 per year	504 09		504 09
James A. Husband	Junior assistant engineer	1,320 per year	363 89		363 89
H. W. Jewell	Junior assistant engineer	1,800 per year	212 73	42 29	255 02
C. T. Kniskern	Junior assistant engineer	1,800 per year	330 00		330 00
B. A. Krotinger	Junior assistant engineer	1,680 per year	415 48		415 48
Jacob Labishiner	Junior assistant engineer	1,320 per year	74 51		74 51
R. B. Smith	Junior assistant engineer	1,800 per year	56 07		56 07
F. S. Belotti	Engineering assistant	1,080 per year	99 00		99 00
H. H. Glosser	Engineering assistant	960 per year	268 88		268 88
C. L. Hawkins	Engineering assistant	960 per year	347 48		347 48
E. S. Niles, Jr	Engineering assistant	840 per year	4 52	6 49	11 01
J. C. Nolan	Engineering assistant	840 per year	25 67		25 67
J. C. Quinterro	Engineering assistant	900 per year	22 00		22 00
Edmund Wilcox	Engineering assistant	840 per year	4 52	$6 49	11 01
F. W. Yates	Engineering assistant	1,080 per year	637 73	4 19	641 92
H. L. Crouse	Laborer	2 50 per day	398 75		398 75
W. B. Lounsbury	Laborer	2 50 per day	211 75		211 75
P. L. Mattimore	Laborer	2 50 per day	143 00		143 00
M. Mets	Laborer	2 50 per day	115 50		115 50
F. J. Norton	Laborer	2 50 per day	195 25		195 25
J. W. Shook	Laborer	2 50 per day	156 75		156 75
			$13,800 00	$368 91	$14,168 91

Incidental Expenses

Livery	$558 50	
Fuel and light	22 69	
Postage	33 61	
Office rent	44 00	
Telephone and telegraph	22 30	
Miscellaneous	149 99	
		831 09
Total		$15,000 00

* Includes additional compensation of 10 per cent allowed above base rate.

Surveys for the State Court of Claims

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Travel	Total
F. W. Harris	Assistant engineer	$2,580 per year	....	$89 93	$89 93
					$89 93
Incidental Expenses					
Livery				$1 75	
Postage				0 59	
Miscellaneous				107 73	
					$110 07
Total					$200 00

Department Surveys

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
F. W. Harris	Assistant engineer	$2,580 per year	$236 50	$265 10	$501 60
G. D. Kellogg	Assistant engineer	2,580 per year	347 23	274 54	621 77
B. T. Kenyon	Assistant engineer	2,580 per year	315 33	348 80	664 13
J. J. Carroll	Junior assistant engineer	1,440 per year	35 13	....	35 13
A. H. Charchian	Junior assistant engineer	1,320 per year	145 72	....	145 72
H. F. Eagan	Junior assistant egnineer	1,800 per year	....	29 66	29 66
H. W. Henderson	Junior assistant engineer	1,440 per year	81 99	....	81 99
H. C. Kelly	Junior assistant engineer	1,680 per year	334 40	....	334 40
C. T. Kniskern	Junior assistant engineer	1,800 per year	31 94	....	31 94
C. T. MacLean	Junior assistant engineer	1,440 per year	280 30	....	280 30
J. A. Waddell	Junior assistant engineer	1,800 per year	179 03	....	179 03
E. E. Fobes	Engineering assistant	840 per year	177 10	....	177 10
William Leffler	Engineering assistant	960 per year	161 45	....	161 45
W. E. Mullen	Engineering assistant	900 per year	49 50	....	49 50
J. C. Quinterro	Engineering assistant	900 per year	48 79	....	48 79
Thomas Ryan, Jr	Engineering assistant	1,080 per year	217 80	....	217 80
James Daly	Laborer	2 50 per day	16 50	....	16 50
W. & L. E. Gurley	....	....	....	19 56	19 56
Keuffel & Esser Co	....	....	....	11 56	11 56
Milton A. Van Hoesen	....	....	....	20 00	20 00
Total	....	....	$2,658 71	$969 22	$3,627 93

State Boundary Line

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
H. F. Eagan	Junior assistant engineer	$1,800 per year	$378 26	....	$378 26

* Includes additional compensation of 10 per cent allowed above base rate.

Delaware–Schoharie County Boundary Line

Chapter 559, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
R. S. Greenman	Senior assistant engineer	$3,300 per year		$74 24	$74 24
H. C. Kline	Assistant engineer	2,580 per year	$777 47	797 23	1,574 70
C. T. Kniskern	Junior assistant engineer	1,800 per year	163 19		163 19
C. W. Wood	Engineering assistant (provisional)	840 per year	41 07		41 07
H. A. Dayton	Engineering assistant	840 per year	221 60		221 60
F. N. McMaster	Engineering assistant (provisional)	840 per year	83 55		83 55
R. H. Slocum	Engineering assistant (provisional)	840 per year	126 45		126 45
D. B. Hall	Laborer	2 50 per day	57 75		57 75
Malcolm McPherson	Laborer	2 50 per day	33 00		33 00
Total			$1,504 08	$871 47	$2,375 55

Saratoga–Warren County Boundary Line

Chapter 561, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
R. S. Greenman	Senior assistant engineer	$3,300 per year		$40 61	$40 61
F. W. Harris	Assistant engineer	2,580 per year	$645 00	1,072 69	1,717 69
L. E. Turpit	Junior assistant engineer	1,440 per year	28 31		28 31
Dwight Douglass	Engineering assistant (provisional)	840 per year	156 33		156 33
J. L. Lochner	Engineering assistant (provisional)	840 per year	168 00		168 00
M. W. Sarr	Engineering assistant (provisional)	840 per year	168 00		168 00
C. W. Wood	Engineering assistant (provisional)	840 per year	197 86		197 86
			$1,363 50	$1,113 30	$2,476 80

Ulster–Greene County Boundary Line

Chapter 562, Laws of 1918; chapter 600, Laws of 1919

NAME	Rank	Rate of compensation	* Services	Expenses	Total
R. S. Greenman	Senior assistant engineer	$3,300 per year		$59 32	$59 32
H. C. Kline	Assistant engineer	2,580 per year	$821 16	1,716 61	2,537 77
H. A. Dayton	Engineering assistant	840 per year	219 64		219 64
H. F. Eagan	Junior assistant engineer	1,800 per year	118 43		118 43
C. W. Wood	Engineering assistant (provisional)	840 per year	92 40		92 40
R. H. Slocum	Engineering assistant (provisional)	840 per year	50 88		50 88
James Daly	Laborer	2 50 per day	132 00		132 00
Elmer Eglinton	Laborer	2 50 per day	38 50		38 50
C. E. George	Laborer	2 50 per day	44 00		44 00
Earl Gossoo	Laborer	2 50 per day	123 75		123 75
Francis Hagadorn	Laborer	2 50 per day	35 75		35 75
Malcolm McPherson	Laborer	2 50 per day	16 50		16 50
C H. Satterlee	Laborer	2 50 per day	129 25		129 25
Roy Satterlee	Laborer	2 50 per day	52 25		52 25
Milton A. Van Hoesen				32 25	32 25
Total			$1,874 51	$1,808 18	$3,682 69

* Includes additional compensation of 10 per cent allowed above base rate.

Land Grants

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
E. V. R. Payne	Senior assistant engineer	$3,300 per year	$121 00		$121 00
G. W. Codwise	Confidential assistant	4,400 per year		$31 10	31 10
T. S. Bailey	Assistant engineer	2,580 per year	236 50		236 50
J. C. Bell	Assistant engineer	2,580 per year	409 89	58 55	468 44
G. E. Gibson	Assistant engineer	2,580 per year	666 50	82 44	748 94
T. R. Hazelum	Assistant engineer	2,160 per year	363 00		363 00
H. W. Hale	Assistant engineer	2,580 per year	12 58	4 16	16 74
E. C. Olcott	Assistant engineer	2,208 per year	12 88	0 50	13 38
C. R. Waters	Assistant engineer	2,340 per year	208 45		208 45
C. T. Kniskern	Junior assistant engineer	1,800 per year	134 87		134 87
Samuel Levine	Junior assistant engineer	1,800 per year	40 14		40 14
L. E. Turpit	Junior assistant engineer	1,560 per year	105 69		105 69
Louis Cicio	Boatman	3 00 per day	3 30		3 30
H. J. Richardson	Photographer	1,680 per year		19 14	19 14
Post Master, Albany, N. Y.				200 00	200 00
Total			$2,314 80	$395 89	$2,710 69

Survey of Lands Under Water

Chapter 12, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
Edward Anderberg	Senior assistant engineer	$3,540 per year	$20 89		$20 89
Horace Corbin	Assistant engineer	2,580 per year	15 77		15 77
H. W. Hale	Assistant engineer	2,580 per year	115 61	$73 85	189 46
Edwin Hilborn	Assistant engineer	2,580 per year	139 53	3 28	142 81
L. T. Howard	Assistant engineer	2,580 per year	15 77		15 77
H. T. Arnold	Junior assistant engineer	1,800 per year	11 00		11 00
H. T. Eagan	Junior assistant engineer	1,800 per year	9 93		9 93
John Edelstein	Junior assistant engineer	1,680 per year	9 39		9 39
F. E. Gillen	Junior assistant engineer	1,800 per year	85 34		85 34
B. A. Krotinger	Junior assistant engineer	1,680 per year	4 52		4 52
Samuel Levine	Junior assistant engineer	1,800 per year	221 94	76 25	298 19
Charles Montag	Junior assistant engineer	1,800 per year	15 40		15 40
Isie Spahn	Junior assistant engineer	1,320 per year	18 51		18 51
Isaac Stern	Junior assistant engineer	1,440 per year	35 65		35 65
Joseph Hoehlein	Engineering assistant	840 per year	24 83		24 83
J. J. Raup	Engineering assistant	1,080 per year	9 58		9 58
James Daly	Laborer	2 50 per day	5 50		5 50
Total			$759 16	$153 38	$912 54

* Includes additional compensation of 10 per cent allowed above base rate.

Jamaica Bay–Peconic Bay Canal

Chapter 317, Laws of 1917; chapter 343, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
F. M. Williams	State Engineer and Surveyor	$8,000 per year		$90 35	$90 35
W. W. Wotherspoon	Superintendent of Public Works			27 45	27 45
Edward Anderberg	Senior assistant engineer	3,540 per year	$409 35	41 78	451 13
R. G. Finch	Chief clerk	4,200 per year		28 75	28 75
J. E. Stewart	Clerk	1,980 per year	165 00		165 00
Emily P. Hoffman	Stenographer	900 per year	82 50		82 50
H. E. Brainard	Assistant engineer	2,580 per year	236 50		236 50
P. H. Budd	Assistant engineer	2,208 per year	13 49	4 50	17 99
J. O. Burt	Assistant engineer	2,160 per year	552 75	922 30	1,475 05
Horace Corbin	Assistant engineer	2,580 per year	76 29		76 29
H. W. Hale	Assistant engineer	2,580 per year	141 44	31 99	173 43
W. S. McDowell	Assistant engineer	2,580 per year	236 50	21 60	258 10
Samuel Levine	Junior assistant engineer	1,800 per year	94 73		94 73
Charles Montag	Junior assistant engineer	1,800 per year	20 53		20 53
Isie Spahn	Junior assistant engineer	1,320 per year	150 98		150 98
G. W. Nostrand	Engineering assistant	900 per year	103 49		103 49
T. J. Torpy, Jr	Engineering assistant	900 per year	182 42		182 42
Louis Cicio	Boatman	3 00 per day	13 20		13 20
W. B. Rowland	Boatman	3 00 per day	69 30		69 30
H. A. Dayton	Laborer	2 50 per day	176 00		176 00
Robert Harmon	Laborer	2 50 per day	231 00		231 00
J. R. Van Schoonhoven	Laborer	2 50 per day		17 95	17 95
H. J. Richardson	Photographer	1,680 per year		32 75	32 75
Joseph Bailey				3 10	3 10
Total			$2,955 47	$1,222 52	$4,177 99

Mill River Survey

Chapter 427, Laws of 1918

NAME	Rank	Rate of compensation	* Services	Expenses	Total
Edward Anderberg	Senior assistant engineer	$3,540 per year	$11 34		$11 34
H. W. Hale	Assistant engineer	2,580 per year	93 66	$67 44	161 10
H. T. Arnold	Junior assistant engineer	1,800 per year	192 18		192 18
John Edelstein	Junior assistant engineer	1,680 per year	36 90		36 90
Isie Spahn	Junior assistant engineer	1,320 per year	25 98		25 98
Geo. W. Nostrand	Engineering assistant	900 per year	2 75		2 75
Louis Cicio	Boatman	3 00 per day	16 50		16 50
William Rowland	Boatman	3 00 per day	19 80		19 80
Total			$399 11	$67 44	$466 55

* Includes additional compensation of 10 per cent allowed above base rate.

Hydrographic Survey

Chapter 181, Laws of 1917; chapter 151, Laws of 1918

In coöperation with United States Geological Survey

William Alexander	$15 00
Alling Company	38 15
John Bisland	27 00
E. D. Burchard	256 52
Max H. Carson	202 36
W. E. Coe	15 00
H. B. Couch	45 00
C. C. Covert	381 52
C. S. De Golyer	51 00
W. & L. E. Gurley	567 75
E. W. Hart	15 00
O. W. Hartwell	583 71
Erastus Ingraham	45 00
Helen R. Kimmey	106 46
Leopold Voelpel & Co	6 75
James Lyons	27 00
G. W. Marvin	45 00
Thos. M. Mills	48 00
J. Wendell Moulton	195 81
New York Telephone Company	29 90
D. L. Orcutt	36 00
C. L. Schenck	45 00
W. J. Shanly	36 00
Mrs. J. E. Sherman	24 00
Total	$2,932 93

SUMMARY

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals

1. Erie canal, chapter 151, Laws of 1918	$6,577 24
2. Champlain canal, chapter 151, Laws of 1918	3,422 76

Construction of Barge Canal

3. Head office account, chapter 147, Laws of 1903, and amendatory laws	212,966 79
4. Erie canal, chapter 147, Laws of 1903, and amendatory laws	52,236 90
5. Champlain canal, chapter 147, Laws of 1903, and amendatory laws	34,015 76

Construction of Barge Canal Terminals

6. Barge canal terminals, chapter 746, Laws of 1911, and amendatory laws	155,691 78

Hudson River Terminals

7. Hudson river terminals, chapter 555, Laws of 1918	4,816 58

Bridge Designers, Engineers, etc.

8. Bridge designers, engineers, etc., chapter 151, Laws of 1918	2,000 00

Special Work

9. High street bridge, Cohoes, chapter 181, Laws of 1917; chapter 151, Laws of 1918	820 98
10. Schenectady-Scotia bridge, chapter 735, Laws of 1917; chapter 634 of 1919	3,356 02
11. Sea-wall, Orient-East Marion, L. I., chapter 428, Laws of 1918	739 52

Special Surveys

12. Blue line surveys, chapter 151, Laws of 1918	15,000 00
13. Surveys for State Court of Claims, chapter 151, Laws of 1918	200 00
14. Department surveys, chapter 151, Laws of 1918	3,627 93
15. State boundary, chapter 151, Laws of 1918	378 26
16. Delaware-Schoharie county boundary line, chapter 559, Laws of 1918	2,375 55
17. Saratoga-Warren county boundary line, chapter 561, Laws of 1918	2,476 80
18. Ulster-Greene county boundary line, chapter 562, Laws of 1918; chapter 600, Laws of 1919	3,682 69
19. Land grants, chapter 151, Laws of 1918	2,710 69
20. Survey of lands under water, chapter 12, Laws of 1918	912 54
21. Jamaica Bay-Peconic Bay canal, chapter 317, Laws of 1917; chapter 343, Laws of 1918	4,177 99
22. Mill river survey, chapter 427, Laws of 1918	466 55
23. Hydrographic survey, chapter 181, Laws of 1917; chapter 151, Laws of 1918	2,932 93
Total	$515,586 26

REPORT

OF THE

DIVISION ENGINEER

OF THE

MIDDLE DIVISION

For the Fiscal Year Ended June 30, 1919

MIDDLE DIVISION

State of New York

Department of State Engineer and Surveyor

Middle Division

Syracuse, N. Y., *July* 1, 1919.

Hon. Frank M. Williams, *State Engineer and Surveyor, Albany, N. Y.:*

Sir.— I have the honor of submitting herewith my annual report as Division Engineer of the Middle Division of the New York State canals for the fiscal year ended June 30, 1919.

Owing to the practical completion of the Barge canal on this Division, the engineering force has been much smaller than for a number of preceding years. It has been employed in looking after a few unfinished contracts and also some special appropriation work, in making surveys and maps for the appropriation and release of lands affected by Barge canal construction in collecting and preparing data for the Court of Claims and in locating and mapping the blue lines of the old Erie canal, preparatory to its abandonment, as detailed below.

In general the Barge canal channel has been of full width and depth throughout the division, and far more free from bars and obstructions than would naturally be expected. The amount of material that was washed into the channel between lock No. 22 and Oneida lake was less than usual and was removed by the Department of Public Works in such a manner as not to interfere with navigation.

The canal structures on the Division are generally in good condition. Some repairs, however, are needed. In my report for last year I called attention to leakage at the Curved dam at Oswego and at the dam across the Owasco outlet at Auburn, stating that repairs should be made.

While there has been no trouble the past year in maintaining the level of the old Erie canal between Syracuse and New London, owing to the wet season, a dry season would tax the reservoirs and feeders severely. It is of the utmost importance that the State be in a position to conserve the waters of the canal system.

The dam across Chittenango creek, at the head of the feeder, is in exceedingly bad condition. It is a wooden structure with masonry abutments and bulkhead walls. It leaks badly, both through and underneath the spillway. It is liable to go out at any time. It should be replaced with a new concrete structure at the earliest possible date.

Cowasselon dam was washed out several years ago. It should be rebuilt in concrete, to divert the water from creek to the feeder.

During the past season the Madison reservoirs have not been used to any extent, owing to the condition of the feeders, which have become so filled with vegetation and slit as to make them almost useless. These reservoirs supply the level of the old canal between Rome and Utica. Although a culvert is being placed under the Barge canal at Rome, to supply this level from the Delta reservoir *via* the Mohawk river, nevertheless, all possible use should be made of the Madison reservoirs. But to do so, the feeders should be cleaned out. This is earnestly recommended.

Each year a large volume of sand is washed into the Barge canal channel by Wood creek and other streams between lock No. 22 and Sylvan Beach, making almost constant dredging necessary. As a partial remedy it is suggested that the banks of the streams entering the canal in this section be planted with willows. As soon as thoroughly rooted the willows will prevent further erosion of the stream banks and consequent deposits of sand in the canal channel.

It seems to be almost impossible to control the speed of the lighter sort of boats using the canal. This is especially true on long reaches between structures. As a consequence in land sections, especially where the prism is in embankment, serious damage has been done. In places where they are formed of light material the banks have been eroded nearly half their thickness at the water-line. It is a self-evident fact that sooner or later all such banks will have to be protected with stone. For this reason

it is recommended that all stone or rock excavated from the canal and placed in spoil-banks adjacent thereto be carefully conserved, as I am satisfied that every yard of such stone will be needed by the State for bank protection in the near future.

Attention is called to the concrete in some of the Barge canal structures. In some instances, notably at lock 24 and at Delta, disintegration of the concrete has become a serious matter. It has progressed to such an extent that extensive repairs are needed at once. The cause of the disintegration is not definitely known at this writing and a most thorough study and careful analysis of the conditions and materials used in construction is recommended, to the end that not only the cause but a remedy may be found.

The appended reports of the Senior Assistant Engineers will give in detail the progress and condition of the work on the Division. There is appended also a tabulation showing the name, rank and compensation of the men on the Division, together with the incidental expenses for the fiscal year.

I heartily thank you and my other superior officers for your courtesy and assistance in performing the work on the Division, and commend the men under me for their support and faithful and efficient service.

Respectfully submitted,

GUY MOULTON,

Division Engineer.

APPENDED REPORTS — MIDDLE DIVISION

SPECIAL APPROPRIATIONS

Improvement of Cowasselon Creek, in the County of Madison, by Dredging and Otherwise

(Chapter 781, Laws of 1917)

Contractor, Robert Provo.
Engineer in charge, David R. Lee.

Engineer's estimate	$12,000.00
Contractor's bid	10,500.00
Amount of final account	9,572.70

Construction of a New Plate Girder Bridge over the Black River Canal at Whitesboro Street, Rome

(Chapter 753, Laws of 1917)

Contractor, Walter S. Rae.
Engineer, William J. Durken.

Engineer's estimate	$12,085.00
Contractor's bid	11,683.00
Work done to date...........................	10,840.00

Construction of a Dive Culvert at Rome

(Chapter 346, Laws of 1918)

Contractors, Scott Bros.
Engineer in charge, Foster B. Crocker.

Engineer's estimate	$42,811.20
Contractor's bid	46,731.20

This contract is for the construction of an 8-foot pipe culvert under the Barge canal at Rome, to furnish water to the section of the Erie canal between Rome and Utica.

Contract work has not been started.

LAND ABANDONMENTS AND SURVEYS

(Chapter 299, Laws of 1916)

Surveys have been made and maps prepared for the abandonment of the old Erie and Oswego canals and all State lands adjacent thereto, all according to rules and regulations laid down by the Commissioners of the Land Office, at the following locations:

Erie canal, between Third and Schuyler streets in the city of Utica.

Erie canal, between Centerport and the Wayne county line.

Oswego canal, from the junction of the Erie and Oswego canals to the north city line of the city of Syracuse.

Oswego canal, lands occupied by the North side-cut.

Oswego canal, lands occupied by the South side-cut.

COURT OF CLAIMS

In addition to the work usually required by the Superintendent of Public Works in connection with ordinary repairs, a large amount of survey work and mapping has been made of property alleged to have been damaged by the State, reports made and data properly arranged for the Court of Claims and the Attorney-General. A large amount of time is spent by the engineers as witnesses for the State on local claims during the sessions of the Court.

BLUE LINE SURVEYS

(Chapter 646, Laws of 1916; chapter 151, Laws of 1918)

These laws provide for surveys, field notes and manuscript maps affecting various canals and canal lands.

Two field parties were constantly at work establishing and monumenting the State's right of way along the Erie and Oswego canals.

One field party, engaged in construction work, at such times as supervision of construction would permit worked intermittently on blue line surveys, establishing the State's right of way in the vicinity of Phoenix.

Field work started July 8, 1918, and has continued since.

The following work has been done during the fiscal year ended June 30, 1919:

Erie Canal

The blue and red lines were established and monumented from the Oneida–Herkimer county line to the west city line of Utica and tracings on standard-sized sheets were completed. These maps were approved by the Canal Board, May 21, 1919.

The red and blue lines were established and monumented from the west corporation line of Rome to New London and tracings on standard-sized sheets made. These maps were approved by the Canal Board, August 6, 1919.

The red and blue lines have been established through the city of Rome. No monuments have as yet been set. The map, on a scale of 1 inch = 100 feet, is about 90 per cent. completed.

The following is a summary of work done between the west city line of Utica and the east corporation line of the city of Rome, a distance of 11.9± miles, during the fiscal year:

Base line run and topography taken over entire line.

Red line established from the west city line of Utica to Clinton street bridge, Whitesboro, a distance of 1½ miles.

Map, on a scale of 1 inch = 100 feet, about 30 per cent platted.

Oswego Canal

The red and blue lines have been established and monumented through the village of Phoenix. Tracings on standard-sized sheets have been completed.

ERIE CANAL, RESIDENCY No. 5.

Senior Assistant Engineer Edward J. Berry reports:

This residency extends from the east end of Oneida county to Oneida lake, a distance of 31.06 miles, and includes the former water-supply residency.

In connection with Barge canal construction, our engineers have been actively engaged in assisting the department of the Superintendent of Public Works, making surveys, sweeping channel, setting buoys and general maintenance work.

Reports are given on contracts Nos. 42-A, 44-A, 156 and 187, terminal contracts Nos. 15-M, 63, and 220, and parts of terminal contracts Nos. 101, 106 and 109.

Contract No. 42-A

This contract is for completing the construction of the canal, together with all incidental work, between the Herkimer–Oneida county line and a point just east of Oriskany road, Sta. 5775. Length, 8.96 miles. It was awarded to Grant Smith & Co. & Locher, being signed on February 24, 1913. Construction work began March 13, 1913. The engineer's preliminary estimate was $1,033,037.85, the contractor's bid, $1,014,671.83. The contract price as modified by alterations Nos. 1 and 2 is $1,239,045.03. Excess steel castings to the value of $220.00 have been authorized by the Canal Board. The work was accepted July 24, 1918, and the final account, amounting to $1,197,244.78, was approved by the Canal Board March 5, 1919. The amount paid on extra work orders to date is $332.69.

Contract work was completed prior to June 30, 1918.

Contract No. 44-A

This contract is for completing the construction of the canal prism near the junction lock at New London. It was awarded to Scott Brothers, being signed on October 10, 1916. Construction work began about November 1, 1916. The engineer's preliminary estimate was $57,050.00, the contractor's bid, $52,486.00.

Foster B. Crocker, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective August 31, 1918, upon approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 31, 1918, was $40,946.71, and payment of balance due on this amount was authorized by the Canal Board on March 19, 1919. The final account for work done prior to April 7, 1917, amounting to $15,295.46, was approved by the Canal Board on March 19, 1919.

This contract has been completed and the total payment, including extra work orders, was $56,242.17.

After a discontinuance of about six months, work was resumed on this contract on July 29, 1918. At that time the State dipper-dredge *Pathfinder* started to work removing material above grade

in prism. This machine worked until August 24, 1918, removing over 12,000 cubic yards of material, which was towed to Oneida lake and spoiled in deep water. This completed the contract.

Contract No. 187

This contract is for placing wash-wall protection between New London and lock No. 22. It was awarded to Scott Brothers, being signed on August 20, 1918. The engineer's preliminary estimate was $17,525.00, the contractor's bid, $22,530.00. The value of work done during the year is $15,470.00.

F. B. Crocker, Assistant Engineer, is in charge.

The placing of wash-wall protection under this contract has been completed, but the work is still to be accepted and final account rendered.

Contract No. 156

This contract is for constructing a highway bridge across Wood creek about one mile east of Sylvan Beach. It was awarded to Chesley, Earl & Heimbach, Inc., being signed on August 28, 1917. Construction work began October 17, 1917. The engineer's preliminary estimate was $7,788.00, the contractor's bid, $9,813.00. The contract price as modified by alteration No. 1, is $10,113.00. Excess quantities to the value of $431.50 have been authorized by the Canal Board. The value of work done during the year is $7,133.38. The work was accepted December 27, 1918, and the final account, amounting to $9,643.30, was approved by the Canal Board February 13, 1919.

F. B. Crocker, Assistant Engineer, was in charge.

During the fiscal year the concrete abutments were poured, steel superstructure erected, bridge approaches finished and the bridge thrown open to traffic.

Terminal Contract No. 15-M — *Utica*

This contract is for electrical equipment and machinery for operating and lighting the Utica terminal lock. It was awarded to Lupfer & Remick, being signed on October 31, 1917. Construction work began April 26, 1918. The engineer's preliminary estimate was $30,681.20, the contractor's bid, $36,967.50. Excess quantities to the value of $123.12 have been authorized by the Canal

Board. The value of work done during the year is $29,929.72. The work was accepted May 21, 1919, and the final account, amounting to $37,069.72, was approved by the Canal Board June 25, 1919.

Lewis Bartlett, Assistant Engineer, was in charge.

During the fiscal year the contractors have completed the erection and testing of all the valve and gate machinery and have placed the electric lights on the lock.

Terminal Contract No. 63 — Utica

This contract is for constructing railroad tracks and brick pavement at the Utica terminal. It was awarded to Harry W. Roberts & Co., being signed on April 19, 1918. The engineer's preliminary estimate was $9,590.00, the contractor's bid, $10,164.00. The contract price as modified by alteration No. 1 is $7,672.00. Excess quantities to the value of $277.00 have been authorized by the Canal Board. The value of work done during the year is $7,632.13. The work was accepted November 13, 1918, and the final account, amounting to $7,632.13, was approved by the Canal Board November 13, 1918. The amount paid on extra work orders during the year is $632.17, total to date, the same.

Lewis Bartlett, Assistant Engineer, was in charge.

Alteration No. 1, approved by the Canal Board July 9, 1918, provides for eliminating railroad tracks and bumping posts and for changing location of pavement. It decreases the contract price by $2,492.00.

An extra work order dated May 8, 1918, provides for making certain alterations to the freight-shed, so as to provide a field office for the engineers at the site. The final account, amounting to $414.63, was approved by the Canal Board August 14, 1918.

An extra work order dated August 12, 1918, provides for building a catch-basin in order to get proper drainage along the roadway leading to the terminal, and also for removing the electric service line pole which stood in the center of the proposed pavement. The final account, amounting to $217.54, was approved by the Canal Board August 31, 1918.

An extra work order dated October 17, 1918, provides for extending the pavement, in order to provide access to the extension to the warehouse built under terminal contract No. 220.

During the fiscal year the catch-basin and tile drain were completed, the concrete sidewalk abutting North Genesee street was laid and the brick pavement finished.

Terminal Contract No. 220 — *Utica*

This contract is for constructing an extension to the Utica terminal freight-house. It was awarded to James T. Young, being signed on August 12, 1918. Construction work began August 14, 1918. The engineer's preliminary estimate was $5,000.00, the contractor's bid, $5,495.00. The value of work done during the year is $5,324.40. The work was accepted October 16, 1918, and the final account, amounting to $5,324.40, was approved by the Canal Board November 13, 1918.

Lewis Bartlett, Assistant Engineer, was in charge.

This contract added an extension 32 feet by 100 feet to the existing freight-house. It was completed by September 25, 1918.

Terminal Contract No. 106

This contract is for furnishing fourteen two-ton steam tractor cranes for Barge canal terminals. The following report relates to the work at Utica. The contract was awarded to the John F. Byers Machine Co., being signed on February 14, 1918. The engineer's preliminary estimate was $5,250.00 per crane, the contractor's bid, $5,265.00 per crane. The contract price as modified by alteration No. 1 is $5,515.00 per crane. The work was accepted September 24, 1918, and the final account, amounting to $5,515.00 for Utica, was approved by the Canal Board October 9, 1918.

Lewis Bartlett, Assistant Engineer, was in charge.

The contractors delivered the maintenance accessories during the month of July, 1918, which completed the contract.

Terminal Contract No. 109

This contract is for furnishing electric capstans and trolley hoists at Pier 6, East river, and West 53d street pier, New York city, and electric capstans at the Utical terminal lock. The following report relates to the work at Utica. The contract was awarded to the General Electric Co., being signed August 2, 1918. The

CONTROLLING WORKS IN THE OSWEGO RIVER AT FULTON (UPPER DAM)

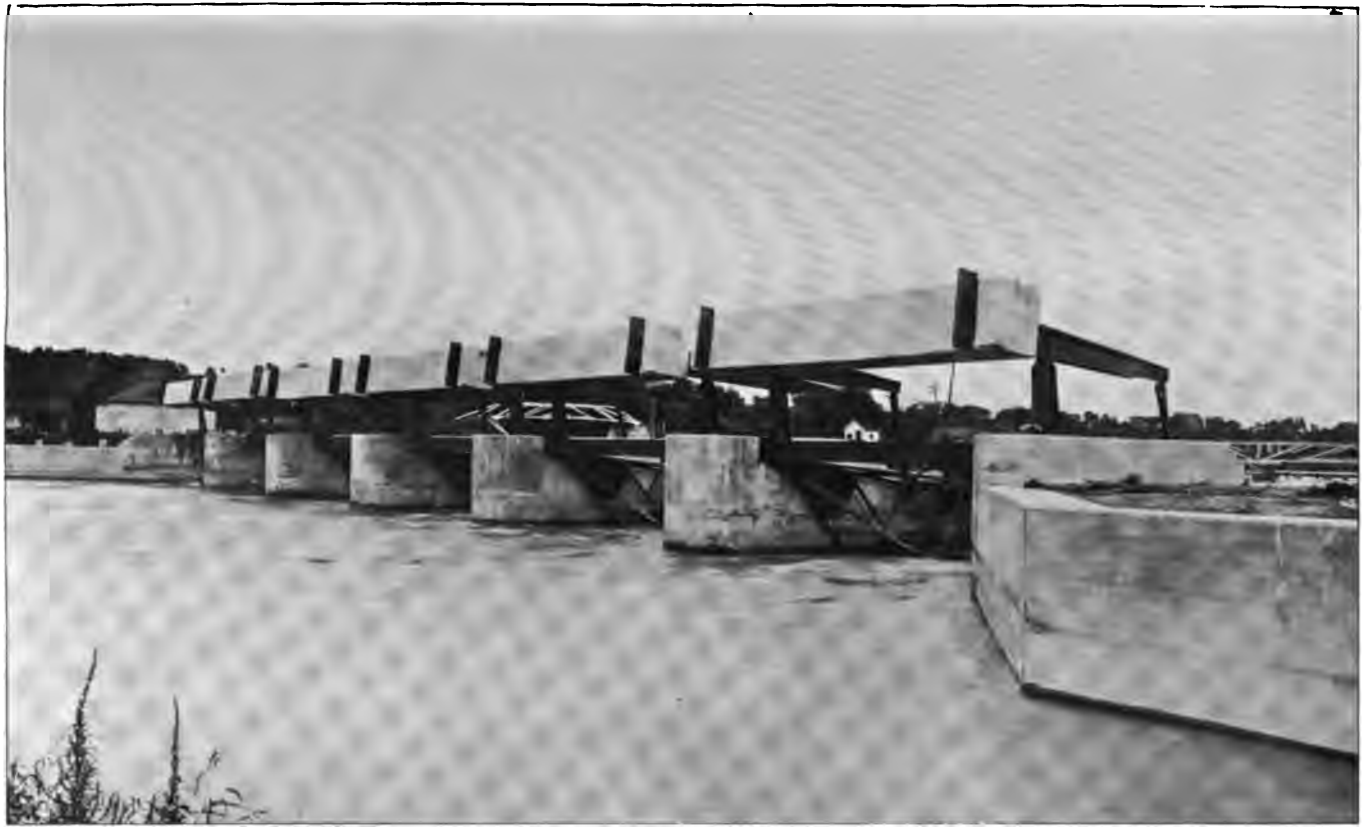
Beside the fixed dam there are Taintor gates and on each side head-gates for an industrial power-plant. The view shows all the Taintor gates open for passing a spring flood.

Dam across the Seneca River at Baldwinsville

View during a spring flood. At the right end of the dam is seen an automatic flood gate.

Dam across the Oswego River at Minetto
View during a spring flood, when 20,000 cubic feet of water per second were flowing.

Dam across the Oswego River South of Oswego
Known as new High dam. View during a spring flood.



CONTROLLING WORKS AT FOOT OF CAYUGA LAKE
By means of these Taintor gates the flow of Seneca river and the water in Cayuga lake are controlled.

CANAL STRUCTURES AT WATERLOO

At the right is the lock with a guard-gate at its head. At the left are Taintor gates, which constitute controlling works to regulate the water in Seneca river and also in Seneca lake.

Canal Structures at Waterloo

In the foreground is a forebay, which carries water to various industrial power-plants. The bridge crosses the forebay and also Seneca river, at the right. Beyond are the Taintor gate controlling works and the guard-gate at the head of the lock.

LAKE STREET BRIDGE, GENEVA

This is a plate girder bridge. The view is over the bridge, looking up Lake street.

Lake Street Bridge, Geneva

Side view. This bridge spans the old Cayuga and Seneca canal and was constructed under authority of chapter 351, Laws of 1918.

engineer's preliminary estimate was $1,500.00 per capstan, the contractor's bid, $1,463.00 per capstan.

Lewis L. Bartlett, Assistant Engineer, is in charge.

No capstans have been delivered at Utica.

Terminal Contract No. 101

This contract is for furnishing and installing steel stiff-leg derricks at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. The following report relates to work at Rome. The contract was awarded to E. Brown Baker, being signed on December 18, 1916. On February 21, 1917, it was assigned to the Mohawk Dredge & Dock Co., Inc., and this assignment was approved by the Superintendent of Public Works March 26, 1917. The engineer's preliminary estimate for derrick at Rome was $3,885.50, the contractor's bid, $5,684.00. Excess metal (Rome) to the value of $1,330.00 has been authorized by the Canal Board. The work was accepted December 4, 1918, and the final account, amounting to $6,831.48, was approved by the Canal Board December 27, 1918.

L. W. Bartlett, Assistant Engineer, was in charge.

The work at Rome had been completed a year ago, but the acceptance and approval of the final account occurred during the past fiscal year.

ERIE CANAL, RESIDENCIES NOS. 6 AND 7

Senior Assistant Engineer Edward J. Berry reports:

Residency No. 6 extends from deep water at the western end of Oneida lake to Baldwinsville, a distance of 23.4 miles, and includes also the work under contract No. 132, which pertains to aids to navigation on Oneida lake.

Residency No. 7 extends from Baldwinsville to the Wayne county line, a distance of 32.7 miles.

Reports are given on the following contracts: Contracts Nos. 46-B, 165, 184 and 188, and a part of No. 172, and terminal contracts Nos. 20, 28 and 213, and a part of No. 106.

Contract No. 184

This contract is for excavating a channel under the N. Y. C. R. R. bridge at Brewerton. It was awarded to Mohawk Dredge & Dock Co., Inc., being signed on April 12, 1918. The engineer's preliminary estimate was $7,200.00, the contractor's bid, $9,480.00. The work was accepted July 9, 1918, and the final account, amounting to $9,562.95, was approved by the Canal Board August 14, 1918.

Contract work was finished on June 21, 1918, prior to the report of a year ago, but the acceptance and approval of the final account occurred during the past fiscal year.

Contract No. 188

This contract is for completing the canal prism excavation at the N. Y. C. R. R. bridge, Brewerton. It was awarded to E. Brown Baker, being signed on August 7, 1918. The engineer's preliminary estimate was $30,000.00, the contractor's bid, $35,400,00. The value of work done during the year is $30,260.00, total done to date, the same.

H. H. Brown, Assistant Engineer, is in charge.

The work has been completed except for a small amount of material that will require drilling and blasting.

Contract No. 165

This contract is for removing the Montezuma aqueduct and completing the canal prism excavation from Sta. 5439 + 48, just east of the aqueduct, to Sta. 5550, near May's Point, and for redredging the canal prism near Fox Ridge. It was awarded to Mohawk Dredge & Dock Co., Inc., being signed on November 23, 1917. Construction work began in December, 1917. The engineer's preliminary estimate was $84,530.00, the contractor's bid, $160,943.00. The value of work done during the year is $29,118.26. The work was accepted January 15, 1919, and the final account, amounting to $145,798.26, was approved by the Canal Board April 2, 1919. The amount paid on extra work orders during the year is $315.69, total to date, the same.

J. G. Palmer, Assistant Engineer, was in charge.

An extra work order dated February 11, 1918, provides for peeling, painting and bolting together fender piles driven at railroad bridges. The final account, amounting to $315.69, was approved by the Canal Board September 24, 1918.

During the fiscal year the prism excavation was completed, all aqueduct masonry, wooden trunk and foundation timbers removed and all foundation piles pulled, thus completing the contract.

Contract No. 46-B

This contract is for completing the construction of a lock, dam, etc., at May's Point. Length, 0.66 mile. It was awarded to Scott Bros., being signed on February 25, 1916. The engineer's preliminary estimate was $314,660.72, the contractor's bid, $277,-348.22. The contract price as modified by alterations Nos. 1 and 2 is $293,676.97. Excess quantities to the value of $3,927.71 have been authorized by the Canal Board. The value of work done during the year is $10,638. The work was accepted April 16, 1919, and the final account, amounting to $269,398.41, was approved by the Canal Board July 16, 1919. The amount paid on extra work orders during the year is $1,451.08, total to date, $1,575.63.

J. G. Palmer, Assistant Engineer, was in charge.

An extra work order dated July 24, 1918, provides for a change in plan of building snubbing-posts by drilling holes for and furnishing and placing dowels, building forms for concrete settings and removing a portion of the backfill already placed; also for payment for piling rendered useless by the changed plans. The final account, amounting to $260.65, was approved by the Canal Board December 10, 1918.

An extra work order dated December 26, 1918, provides for moving derrick, laying track, housing needles, lumber delivered and closing openings in steel sheet-piling. The final account, amounting to $976.58, was approved by the Canal Board February 13, 1919.

An extra work order dated March 20, 1919, provides for cutting away parts of Z-bars which rest upon wicket stiffener angles and attaching oak planking to lower gates of the movable dam at May's

Point. The final account, amounting to $213.85, was approved by the Canal Board July 25, 1919.

During the fiscal year the embankment at the south approach to the movable dam was placed, chains and counterweights for lower gates and wickets instaled and embankments covered with top soil and seeded.

Contract No. 172

This contract is for furnishing and delivering barrel buoys and lamp posts for aid to navigation on the Seneca, Clyde, Genesee and Tonawanda rivers. It was awarded to Lupfer & Remick, being signed on March 15, 1918. The engineer's preliminary estimate for the whole contract was $14,853.00, the contractor's bid, $13,063.20. The contract price as modified by alteration No. 1 is $12,921.45. The value of work done during the year is $1,693.35. The work was accepted September 24, 1918, and the final account, amounting to $12,913.35, was approved by the Canal Board September 24, 1918. The amount paid on extra work orders to date is $906.50, of which amount $465.50 applies to work on this residency.

N. R. McLoud, Junior Assistant Engineer, was in charge.

The final estimate for work on this residency amounted to $6,398.45.

Work on this residency was completed during the summer of 1918.

Terminal Contract No. 28 — *Cleveland*

This contract is for constructing a harbor, dockwall and two breakwaters on Oneida lake at Cleveland. It was awarded to Clarence E. Gruner, being signed on February 15, 1915. It was assigned to Barrally & Ingersoll and this assignment was approved by the Superintendent of Public Works March 15, 1915. Construction work began in June, 1915. The engineer's preliminary estimate was $34,575.00, the contractor's bid, $30,673.00. The contract price as modified by alterations Nos. 1 and 2 is $37,222.00. Excess quantities to the value of $1,675.00 have been authorized by the Canal Board. The value of work done during the year is $3,010.00, total done to date, $35,120.

W. J. Durkan, Assistant Engineer, is in charge.

During the fiscal year seven concrete tops were placed on the east breakwater pier, finishing that pier. With the exception of a few small areas above grade in the channel contract work is completed.

Terminal Contract No. 20 — Syracuse

This contract is for constructing a terminal basin with a connecting channel to Onondaga lake, also piers, dockwalls, spillway and a highway bridge at Syracuse. It was awarded to the Walsh Construction Co., Inc., being signed on November 4, 1915. Construction work began in same month. The engineer's preliminary estimate was $665,875.00, the contractor's bid, $419,659.00. The contract price as modified by alterations Nos. 1, 2, 3 and 4 is $549,878.26. Excess sheeting and bracing to the value of $25,200.00 has been authorized by the Canal Board. The amount paid on extra work orders to date is $1,174.50.

A. G. Card, Assistant Engineer, is in charge.

Alteration No. 4, approved by the Canal Board December 27, 1918, provides for eliminating riprap along N. Y. C. R. R. embankment facing the lake front. It decreases the contract price by $16,875.00.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on December 27, 1918. The cancelation became effective February 13, 1919, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to February 13, 1919, was $285,727.10, and payment of balance due on this amount was authorized by the Canal Board on May 21, 1919. The final account for work done prior to April 7, 1917, amounting to $358,981.95, was approved by the Canal Board on May 7, 1919.

This contract has been completed and the total payment, including extra work orders, was $645,484.

During the fiscal year the clearing and removing of buildings on terminal site was completed, channel excavation completed north of Hiawatha street, riprap laid at the north end of the west abutment of the N. Y. C. R. R. bridge and six clusters

of guide piles driven in Onondaga lake. Excavation beyond the limits of surfacing was completed. All cinder surfacing on piers and along walls and approach was laid 24 inches thick and rolled. Fender piles were driven on corners of piers and fender timbers placed on dockwalls for the entire length.

Terminal Contract No. 213 — *Syracuse*

This contract is for constructing a frame freight-house and four electrically-operated timber derricks at Syracuse. It was awarded to the Savage Construction Co., being signed on February 14, 1918. Construction work began in February, 1918. The engineer's preliminary estimate was $28,200.00, the contractor's bid, $27,032.00. The contract price as modified by alteration No. 1 is $26,997.00. The value of work done during the year is $11,816.40. The work was accepted May 21, 1919, and the final account, amounting to $26,346.40, was approved by the Canal Board June 25, 1919. The amount paid on extra work orders during the year is $371.82, total to date, the same.

A. G. Card, Assistant Engineer, is in charge.

An extra work order dated January 3, 1919, provides for installing transmission line from service line of Syracuse Lighting Co. to the freight-house and furnishing and installing transformers. The final account, amounting to $371.82, was approved by the Canal Board June 11, 1919.

During the fiscal year the carpenter work and painting were finished, the derrick hoists, motors and controllers delivered and placed, and the transmission line erected and tested. The freight-house was opened for use in September.

Terminal Contract No. 106

This contract is for furnishing fourteen two-ton steam tractor cranes for Barge canal terminals. One of these is for the Syracuse terminal. The contract was awarded to the John F. Byers Machine Co., being signed on February 14, 1918. The engineer's preliminary estimate was $5,250.00 per crane, the contractor's bid, $5,265.00 per crane. The contract price as modified by alteration No. 1 is $5,515.00 per crane. The work was

accepted September 24, 1918, and the final account, amounting to $5,515.00 for Syracuse, was approved by the Canal Board October 9, 1918.

A. G. Card, Assistant Engineer, was in charge.

The crane for the Syracuse terminal was delivered during the past fiscal year.

OSWEGO CANAL RESIDENCY

Senior Assistant Engineer Edward J. Berry reports:

This residency comprises all work on the Oswego canal. Reports are given on contracts Nos. 99, 117, 167 and 182, and terminal contracts Nos. 30, 33-P, 59, 60 and 226, and part of No. 106.

Contract No. 167

This contract is for constructing a bascule bridge below lock No. 1, at Culvert street, Phoenix. It was awarded to Walter S. Rae, being signed on October 13, 1917. Construction work began in May, 1918. The engineer's preliminary estimate was $26,653.60, the contractor's bid, $29,689.30. The value of work done during the year is $17,460.00, total done to date, $18,460.00.

N. R. McLoud, Junior Assistant Engineer, is in charge.

All the excavation has been completed, the abutments and approaches built, steel superstructure erected and operating machinery partially installed.

Contract No. 117

This contract is for constructing a swing-bridge over lock No. 2 at Fulton. It was awarded to Walter S. Rae, being signed on April 15, 1918. Construction work began October 21, 1918. The engineer's preliminary estimate was $34,713.30, the contractor's bid, $36,513.80. The value of work done during the year is $11,570, total done to date, the same.

H. H. Brown, Assistant Engineer, is in charge.

The main pivot foundation and bridge lock have been completed. Concrete work in the east and west abutments is well under way.

Contract No. 99

This contract is for constructing portions of a bridge over the Oswego river at Minetto. It was awarded to Larkin & Sangster, being signed on September 12, 1916. The engineer's preliminary estimate was $117,170.75, the contractor's bid, $115,980.75.

Edward M. Ellis, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective December 10, 1918, upon approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to December 10, 1918, was $141,096.59, and payment of balance due on this amount was authorized by the Canal Board on February 13, 1919. The final account for work done prior to April 7, 1917, amounting to $11,250.65, was approved by the Canal Board on February 13, 1919.

This contract has been completed and the total payment, including extra work orders, was $153,086.24.

During the past year the sidewallks were completed, the pavement laid, riveting of new steel superstructure finished and the site cleaned up.

Contract No. 182

This contract is for completing excavation in front of the terminal dockwall below lock No. 8, Oswego. It was awarded to E. Brown Baker, being signed on August 30, 1918. Construction work began November 21, 1918. The engineer's preliminary estimate was $28,215.00, the contractor's bid, $30,267.00. The value of work done during the year is $26,660.00.

George Haley, Assistant Engineer, is in charge.

Contract work is completed with the exception of the removal of a few high spots.

Terminal Contract No. 30 — *Oswego, River Terminal*

This contract is for constructing a dockwall, an approach to the terminal and appertaining structures on the east side of the Oswego river between Schuyler and Cayuga streets, Oswego. It

was awarded to Henry P. Burgard, being signed on March 24, 1916. Construction work began in April, 1916. The engineer's preliminary estimate was $103,700.00, the contractor's bid, $90,-984.00. The contract price as modified by alterations Nos. 1, 2 and 3 is $106,166.70. Excess quantities to the value of $943.00 have been authorized by the Canal Board. The work was accepted June 26, 1918, and the final account, amounting to $100,382.70, was approved by the Canal Board September 24, 1918. The amount paid on extra work to date is $1,406.50.

George H. Haley, Assistant Engineer, was in charge.

Construction work had been completed and accepted prior to July 1, 1918, but the final account was approved during the past fiscal year.

Terminal Contract No. 106

This contract is for furnishing fourteen two-ton steam tractor cranes for Barge canal terminals. One of these is for use at Oswego. The contract was awarded to the John F. Byers Machine Co., being signed on February 14, 1918. The engineer's preliminary estimate was $5,250.00 per crane, the contractor's bid, $5,265.00 per crane. The contract price as modified by alteration No. 1 is $5,515.00 per crane. The value of the work done at Oswego during the year is $1,305.00. The work was accepted September 24, 1918, and the final account, amounting to $5,515.00 for the work at Oswego, was approved by the Canal Board, October 9, 1918.

The crane had been delivered at Oswego prior to a year ago, but the work was accepted and the final account approved during the past fiscal year.

Terminal Contract No. 226 — *Oswego, River Terminal*

This contract is for constructing a frame freight-house and compacting gravel surfacing on the river terminal, Oswego. It was awarded to J. A. Laporte, being signed on April 28, 1919. Construction work began May 13, 1919. The engineer's preliminary estimate was $6,000.00, the contractor's bid, $5,199.00. The value of work done during the year is $5,030.

Construction work was practically completed during the month of June, 1919.

Terminal Contract No. 59 — *Oswego, Lake Terminal*

This contract is for constructing a railroad track approach to the terminal pier at Oswego. It was awarded to W. F. Martens, being signed on May 6, 1918. Construction work began in May, 1918. The engineer's preliminary estimate was $5,100.00, the contractor's bid, $6,516.00. The value of work done during the year is $3,771.41. The work was accepted August 31, 1918, and the final account, amounting to $5,391.41, was approved by the Canal Board December 27, 1918.

George H. Haley, Assistant Engineer, was in charge.

During the year the placing of ballast was done, the tracks brought to final alignment and contract work completed.

Terminal Contract No. 60 — *Oswego, Lake Terminal*

This contract is for constructing railroad and crane tracks on the terminal pier at Oswego. It was awarded to W. F. Martens, being signed on May 6, 1918. Construction work began in May 1918. The engineer's preliminary estimate was $8,365.00, the contractor's bid, $9,690.00. The value of work done during the year is $5,709. The work was accepted August 31, 1918, and the final account, amounting to $9,119.00, was approved by the Canal Board December 27, 1918.

George H. Haley, Assistant Engineer, was in charge.

During the year the placing of ballast was done, the tracks brought to final alignment and contract work completed.

Terminal Contract No. 33-P — *Oswego, Lake Terminal*

This contract is for paving part of the terminal pier at Oswego. It was awarded to Guy B. Dickison, being signed on May 7, 1918. Construction work began August 19, 1918. The engineer's preliminary estimate was $11,010.00, the contractor's bid, $11,730.00. Excess excavation to the value of $240.00 has been authorized by the Canal Board. The value of work done during the year is $11,329.00. The work was accepted October 16, 1918, and the final account, amounting to $11,329.00, was approved by the Canal Board January 15, 1919.

George H. Haley, Assistant Engineer, was in charge.

Contract work was completed September 26, 1918.

CAYUGA AND SENECA CANAL RESIDENCY

Senior Assistant Engineer H. C. Smith reports:

This residency comprises all the work on the Cayuga and Seneca canal. Reports follow on contracts M, Q, R, T and U. The construction of bridges at Lake street, Geneva, and of a concrete dock-wall at Canandaigua lake harbor, authorized by special acts of the Legislature, have been under the supervision of this office. Reports on this work follow those on the Barge canal contracts.

Contract R

This contract is for completing the unfinished work at several locations on the Cayuga and Seneca canal. It was awarded to the Sherman-Stalter Company, being signed on April 30, 1918. Construction work began May 22, 1918. The engineer's preliminary estimate was $185,259.00, the contractor's bid, $180,122.80. The value of work done during the year is $158,264.38. The work was accepted May 21, 1919, and the final account, amounting to $173,434.38, was approved by the Canal Board August 20, 1919.

L. L. Hadley, Assistant Engineer, was in charge.

During the year prism excavation was completed at Mud lock, at Cayuga, at the N. Y. C. R. R. bridge 2½ miles east of Seneca Falls and at the Lehigh Valley R. R. bridges near Seneca lake. Temporary highway bridges were removed at Lake road, at Kingdon bridge west of Seneca Falls and at Free bridge. Excavation for the approach wall at Mud lock was made, the wall built and backfill placed. Construction work was completed on April 29, 1919.

Contract M

This contract is for constructing power-plants and for furnishing and installing electrical equipment and machinery for operating and lighting locks Nos. 1, 2, 3 and 4. It was awarded to Lupfer & Remick, being signed on November 5, 1914. Construction work began January 23, 1915. The engineer's preliminary estimate was $176,087.00, the contractor's bid, $188,031.00. The contract price as modified by alterations Nos. 1 and 2 is $191,405.00. Excess chipping concrete to the value of $410.40 has been authorized by the Canal Board. The work was

accepted December 4, 1918, and the final account, amounting to $190,274.64, was approved by the Canal Board December 4, 1918. The amount paid on extra work orders during the year is $221.35, total to date, the same.

Alteration No. 2, approved by the Canal Board September 24, 1918, provides for eliminating certain work from the contract. It decreases the contract price by $31.00.

The final account of extra work order dated March 16, 1918, amounting to $221.35, was approved by Canal Board December 27, 1918. The only work done during the year was in completing the changing of racks under this work order.

Contract T

This contract is for extending the core wall and other work at north end of dam No. 2, Seneca Falls. It was awarded to Kennedy & Scullen Construction Co., Inc., being signed on January 20, 1919. Construction work began March 11, 1919. The engineer's preliminary estimate was $22,964.00, the contractor's bid, $22,-300.50. The value of work done during the year is $5,480.00, total done to date, the same.

L. L. Hadley, Assistant Engineer, is in charge.

The 60-foot trench specified on the plans has been excavated to rock. Nine test drill holes have been drilled in the southerly end of this trench and five of them grouted.

Contract U

This contract is for repairing the manholes of the sewer in Benton creek, Seneca Falls. It was awarded to Smith Soper, being signed on January 3, 1919. Construction work began January 6, 1919. The engineer's preliminary estimate was $5,941.00, the contractor's bid, $7,382.00. The value of work done during the year is $5,147.68. The work was accepted April 16, 1919, and the final account, amounting to $5,147.68, was approved by the Canal Board August 6, 1919.

L. L. Hadley, Assistant Engineer, was in charge.

The contract work was completed on March 25, 1919.

Contract Q

This contract is for constructing pile dolphins on Cayuga and Seneca lakes. It was awarded to W. F. Martens, being signed on March 3, 1919. Construction work began April 24, 1919. The engineer's preliminary estimate was $5,225.00, the contractor's bid, $5,092.00. The value of work done during the year is $5,090.00, total done to date, the same.

L. L. Hadley, Assistant Engineer, is in charge.

The 19 dolphins called for by the contract were constructed and construction work was completed on June 30, 1919.

Concrete Dockwall at Canandaigua Lake Harbor

(Chapter 756, Laws of 1917)

The work of constructing a concrete dockwall at Canandaigua lake harbor, in the county of Ontario, was done under a contract awarded to W. F. Martens, which was signed on May 6, 1918, the contractor's bid being $15,012.00. Work was started on August 30, 1918, and completed on April 24, 1919. The final estimate was $11,606.89.

L. L. Hadley, Assistant Engineer, was in charge.

The old dockwall was some 1,200 feet long.

On May 6, 1918, before work was started on this contract, an agreement was entered into between the contractor and the State whereby the 560 feet of new dockwall was made to begin at the northerly end of the old dockwall, which was some 1,200 feet long, and run towards the south end rather than begin at the southerly end and run northerly. All contract prices remained unchanged.

On August 31, 1918, a second supplementary agreement was entered into between the contractor and the State whereby additional amounts of excavation and backfill, second-class concrete, metal reinforcement and chipping concrete were done.

Plate Girder Bridge at Lake Street, Geneva

(Chapter 351, Laws of 1918)

The contract for this work provides for the construction of a plate girder bridge over the old Cayuga and Seneca canal at Lake street, Geneva, Ontario county.

It was awarded to E. Brown Baker, being signed on November 23, 1918, and the contractor's bid being $69,100.00. Work was started on May 3, 1919.

L. L. Hadley, Assistant Engineer, is in charge.

By a supplementary agreement dated June 11, 1919, the work of constructing the temporary highway bridge for vehicle traffic, provided for under chapter 246, Laws of 1919, was added to this contract, increasing the amount of the contract by $1,300.00.

The old highway bridge has been removed, a coffer-dam constructed for the west abutment and the greater part of the excavation for this abutment done. The temporary bridge was constructed and is now in use.

Chief of the contractor's plant is a scow, on which is a derrick with a 70-ft. boom.

Temporary Bridge at Lake Street, Geneva

(Chapter 246, Laws of 1919)

This law provided for the construction of a temporary bridge for vehicle traffic during the construction of the plate girder bridge over the old Cayuga and Seneca canal at Lake street, Geneva, being built under chapter 351, Laws of 1918. By special agreement this work was added to the contract for building the plate girder bridge.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE MIDDLE DIVISION OF THE DEPARTM NT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED JUNE 30, 1919.

Ordinary Repairs to Canals — Erie Canal

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
Guy Moulton	Division engineer	$4,800 per year	$1,980 00	....	$1,980 00
E. J. Berry	Senior assistant engineer	3,300 per year	907 50	$0 85	908 35
W. S. Morris	Estimate clerk	2,100 per year	2,257 50	3 00	2,260 50
H. L. Bassett	Cashier	1,800 per year	495 00	....	495 00
Harvey Wagner	Stenographer	1,500 per year	550 00	....	550 00
C. W. Chase	Chauffeur	1,500 per year	412 50	....	412 50
M. Sheridan	Telephone operator	840 per year	115 50	....	115 50
John Connors	Janitor	1,200 per year	228 25	....	228 25
John Maley	Fireman	1,080 per year	101 61	....	101 61
I. S. Badger	Assistant engineer	2,580 per year	473 00	....	473 00
D. R. Lee	Assistant engineer	2,340 per year	7 66	2 04	9 70
C. F. Hopstein	Junior assistant engineer	1,800 per year	631 08	46 99	678 07
J. H. Forth	Junior assistant engineer	1,680 per year	148 50	....	148 50
M. J. Chryst	Junior assistant engineer	1,680 per year	291 54	....	291 54
E. L. Keeler	Junior assistant engineer	1,800 per year	135 54	....	135 54
H. R. Horton	Junior assistant engineer	1,200 per year	11 79	....	11 79
A. W. Bischel	Engineering assistant	1,080 per year	49 50	....	49 50
Gail Bowler	Engineering assistant	840 per year	77 00	....	77 00
C. H. Norton	Laborer	2 50 per day	214 50	....	214 50
R. D. Smith	Laborer	2 50 per day	68 75	....	68 75
			$9,156 72	$52 88	$9,209 60
Incidental Expenses					
Livery				$12 00	
Stationery and printing				35 26	
Postage				52 08	
Telephone and telegraph				12 62	
Miscellaneous				432 99	
					544 95
Total					$9,754 55

Ordinary Repairs to Canals — Black River Canal

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
R. K. Sheldon	Assistant engineer	$2,580 per year	$68 66	$47 17	$115 83
J. J. Ryan	Junior assistant engineer	1,800 per year	31 94	....	31 94
J. E. Smith	Junior assistant engineer	1,800 per year	31 94	....	31 94
A. Moosbrugger	Engineering assistant	1,080 per year	19 16	....	19 16
P. Ryan	Boatman	3 00 per day	16 50	....	16 50
			$168 20	$47 17	$215 37
Incidental Expenses					
Livery					15 00
Total					$230 37

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Erie Canal

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
Guy Moulton	Division engineer	$4,800 per year	$850 00	$132 16	$982 16
E. J. Berry	Senior assistant engineer	3,300 per year	1,183 75	176 68	1,360 43
H. L. Bassett	Cashier	1,800 per year	1,290 00	....	1,290 00
L. J. Mulhauser	Stenographer	1,500 per year	540 00	....	540 00
I. S. Badger	Assistant engineer	2,580 per year	1,194 29	19 70	1,213 99
Geo. H. Briggs	Assistant engineer	2,580 per year	1,998 72	71 25	2,069 97
F. B. Crocker	Assistant engineer	2,580 per year	2,751 65	279 19	3,030 84
L. Bartlett	Assistant engineer	2,580 per year	1,267 64	368 64	1,636 28
C. W. Costello	Assistant engineer	2,580 per year	1,354 50	454 55	1,809 05
W. J. Durkan	Assistant engineer	2,580 per year	197 74	1 57	199 31
H. H. Brown	Assistant engineer	2,580 per year	850 76	77 35	928 11
J. G. Palmer	Assistant engineer	2,580 per year	2,537 00	386 75	2,923 75
C. L. Bannister	Assistant engineer	2,580 per year	709 50	....	709 50
R. K. Sheldon	Assistant engineer	2,580 per year	601 43	223 45	824 88
G. S. Haight	Assistant engineer	2,340 per year	2,280 24	....	2,280 24
D. R. Lee	Assistant engineer	2,340 per year	164 45	....	164 45
H. J. O'Neil	Assistant engineer	2,340 per year	896 30	27 95	924 25
W. S. Saxton	Assistant engineer	2,160 per year	887 81	....	887 81
C. F. Hopstein	Junior assistant engineer	1,800 per year	933 16	68 45	1,001 61
E. L. Keeler	Junior assistant engineer	1,800 per year	366 78	....	366 78
Geo. H. Thomas	Junior assistant engineer	1,800 per year	880 92	....	880 92
N. R. McLoud	Junior assistant engineer	1,800 per year	919 06	285 56	1,204 62
M. H. Boigeol	Junior assistant engineer	1,800 per year	979 84	....	979 84
J. J. Ryan	Junior assistant engineer	1,800 per year	414 27	....	414 27
J. E. Smith	Junior assistant engineer	1,800 per year	101 12	....	101 12
J. H. Forth	Junior assistant engineer	1,680 per day	1,233 00	4 00	1,237 00
H. C. Smith	Junior assistant engineer	1,680 per year	950 11	7 90	958 01
M. J. Chryst	Junior assistant engineer	1,680 per year	332 69	75	333 44
G. L. Stillman	Junior assistant engineer	1,680 per year	399 27	....	399 27
F. J. Beach	Junior assistant engineer	1,560 per year	1,426 74	....	1,426 74
R. E. Homan	Junior assistant engineer	1,560 per year	386 42	....	386 42
H. A. Shafer	Junior assistant engineer	1,500 per year	377 88	....	377 88
J. S. Bierhardt	Junior assistant engineer	1,440 per year	459 68	....	459 68
D. D. Rogers	Junior assistant engineer	1,200 per year	124 19	....	124 19
H. R. Horton	Junior assistant engineer	1,200 per year	70 96	....	70 96
R. M. R. Howard	Junior assistant engineer	1,200 per year	30 52	....	30 52
L. A. Kavanagh	Engineering assistant	1,080 per year	701 20	....	701 20
A. Moosbrugger	Engineering assistant	1,080 per year	64 18	....	64 18
Frank Lutz	Engineering assistant	1,020 per year	783 30	....	783 30
Gail Bowler	Engineering assistant	900 per year	310 65	....	310 65
Daniel Scanlon	Engineering assistant	900 per year	61 41	....	61 41
Parnell Maroney	Engineering assistant	840 per year	27 32	....	27 32
W. H. Benson	Engineering assistant	840 per year	18 67	....	18 67
E. S. Niles, Jr.	Engineering assistant	840 per year	2 33	....	2 33
Frank Ladd	Boatman	3 00 per day	653 40	$15 53	668 93
Arthur Preston	Boatman	3 00 per day	478 50	....	478 50
Patrick Ryan	Boatman	3 00 per day	422 40	....	422 40
L. G. Hyle	Laborer	2 50 per day	88 00	....	88 00
Frank Brophy	Laborer	2 50 per day	750 75	....	750 75
G. M. Wilcox	Laborer	2 50 per day	434 50	....	434 50
C. Peacock	Laborer	2 50 per day	530 75	....	530 75
W. T. Tanner, Jr.	Laborer	2 50 per day	792 00	....	792 00
Harold Higgins	Laborer	2 50 per day	396 00	....	396 00
C. H. Norton	Laborer	2 50 per day	426 25	....	426 25
D. W. Traub	Laborer	2 50 per day	5 50	....	5 50
W. H. Benson	Laborer	2 50 per day	57 75	....	57 75
F. Voorhees	Laborer	2 50 per day	261 25	....	261 25
E. S. Niles, Jr.	Laborer	2 50 per day	236 50	....	236 50
C. P. Plummer	Laborer	2 50 per day	57 75	....	57 75
C. W. Chase	Chauffeur	1,500 per year	537 50	36 60	574 10
John Connors	Janitor	1,200 per year	110 00	....	110 00
C. H. Osterhout	Fireman	1,080 per year	23 22	....	23 22
Dan Burhans	Gage reader	120 per year	120 00	....	120 00
Wm. Prettie	Gage reader	120 per year	120 00	....	120 00
F. J. Graves	Gage reader	120 per year	10 00	....	10 00
Marie Brandt Brown	Gage reader	84 per year	77 00	....	77 00
J. R. Bixby	Gage reader	84 per year	77 00	....	77 00
A. H. Hoffmeister	Gage reader	84 per year	84 00	....	84 00
Ida C. Powell	Gage reader	84 per year	84 00	....	84 00

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Erie Canal — (Continued)

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	*Services	Travel	Total
H. L. Ropes	Gage reader	$84 per year	$61 19	....	$61 19
W. S. Siver	Gage reader	84 per year	84 00	....	84 00
Mrs J. R. Hiller	Gage reader	84 per year	28 00	....	28 00
J. P Patterson	Gage reader	84 per year	56 00	....	56 00
L. Sitterly	Gage reader	84 per year	84 00	....	84 00
John Phillips	Gage reader	72 per year	72 00	....	72 00
L. A. Withey	Gage reader	72 per year	71 00	....	71 00
H. W. Hoch	Gage reader	60 per year	40 00	....	40 00
P. A. Wade	Gage reader	60 per year	4 50	....	4 50
Fred Chamberlain	Gage reader	60 per year	60 00	....	60 00
A. R. Gates	Gage reader	60 per year	60 00	....	60 00
A. R. Merritt	Gage reader	60 per year	60 00	....	60 00
M. Smith	Gage reader	60 per year	60 00	....	60 00
Wm. H. Burns	Gage reader	60 per year	60 00	....	60 00
Mark Quimby	Gage reader	60 per year	60 00	....	60 00
Geo. E. Wright	Livery	....	....	$274 00	274 00
L. A. Withey	Livery	....	....	125 00	125 00
M. K. Ryan	Livery	....	....	100 00	100 00
M. E. Nicholson	Livery	....	....	125 00	125 00
M. J. Colvin	Livery	....	....	25 00	25 00
			$41,606 16	$3,287 03	$44,893 19
	Incidental Expenses				
Office rent				$215 00	
Fuel and light				359 28	
Stationery and printing				35 74	
Postage				112 42	
Telephone and telegraph				416 34	
Miscellaneous				2,028 84	
					3,167 62
Total					$48,060 81

Construction of Barge Canal — Oswego Canal

Chapter 147, Laws of 1903, and amendatory laws.

NAME	Rank	Rate of compensation	*Services	Travel	Total
Guy Moulton	Division engineer	$4,800 per year	$850 00	$8 15	$858 15
E. J. Berry	Senior assistant engineer	3,300 per year	632 68	4 07	636 7
H. L. Bassett	Cashier	1,800 per year	150 00	....	150 05
Harvey Wagner	Stenographer	1,500 per year	675 00	....	675 00
L. J Mulhauser	Stenographer	1,500 per year	328 48	....	328 40
E. M. Ellis	Assistant engineer	2,580 per year	849 44	158 01	1,007 48
H. H. Brown	Assistant engineer	2,580 per year	1,901 80	239 69	2,141 45
Geo. H. Haley	Assistant engineer	2,580 per year	1,395 09	21 47	1,416 59
W. J. Durkan	Assistant engineer	2,580 per year	83 92	2 26	86 16
A. G. Card	Assistant engineer	2,580 per year	22 89	....	22 88
W. S. Saxton	Assistant engineer	2,160 per year	1,442 44	....	1,442 49
N. R. McLoud	Junior assistant engineer	1,800 per year	1,015 94	116 09	1,132 04
M. H. Boigeol	Junior assistant engineer	1,800 per year	955 16	....	955 13
C. F. Hopstein	Junior assistant engineer	1,800 per year	207 93	15 33	223 26
J. E. Smith	Junior assistant engineer	1,800 per year	15 97	2 76	18 76
E L. Keeler	Junior assistant engineer	1,800 per year	29 46	....	29 3
M. J. Chryst	Junior assistant engineer	1,680 per year	194 63	....	194 46
W J. Bell	Junior assistant engineer	1,320 per year	648 24	....	648 63
R. J. Storm	Junior assistant engineer	1,200 per year	1,188 71	....	1,188 21
					71

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Oswego Canal — (Continued)

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
A. Moosbrugger	Engineering assistant	$1,080 per year	$9 58	....	$9 58
L. B. Hotchkiss	Engineering assistant	840 per year	148 60	....	148 60
E. S. Niles, Jr.	Engineering assistant	840 per year	25 67	....	25 67
Patrick Ryan	Boatman	3 00 per day	9 90	....	9 90
Thos. Moran	Boatman	3 00 per day	610 50	....	610 50
C. H. Norton	Laborer	2 50 per day	148 50	....	148 50
Chas. Smith	Laborer	2 50 per day	200 75	....	200 75
E. S. Niles, Jr.	Laborer	2 50 per day	66 00	....	66 00
L. G. Hyle	Laborer	2 50 per day	5 50	....	5 50
Patrick Hickey	Laborer	2 50 per day	522 50	....	522 50
E. F. Allen	Laborer	2 50 per day	115 50	....	115 50
C. W. Chase	Chauffeur	1,500 per year	137 50	$7 85	145 35
John Connors	Janitor	1,200 per year	275 00	....	275 00
M. Sheridan	Telephone operator	840 per year	38 50	....	38 50
C. H. Osterhout	Fireman	1,080 per year	45 00	....	45 00
W. S. Morris	Estimate clerk	2,100 per year	....	2 65	2 65
B. M. Wilcox	Gage reader	60 per year	60 00	....	60 00
D. D. Tompkins	Gage reader	60 per year	55 00	....	55 00
Leon Hallenbeck	Gage reader	60 per year	42 26	....	42 26
Arthur Gray	Gage reader	60 per year	12 74	....	12 74
			$15,116 78	$578 33	$15,695 11
Incidental Expenses					
Fuel and light				$121 80	
Stationery and printing				2 50	
Postage				128 60	
Telephone and telegraph				215 32	
Miscellaneous				488 41	
					956 63
Total					$16,651 74

Construction of Barge Canal — Cayuga and Seneca Canal

Chapter 391, Laws of 1909, and amendatory laws

NAME	Rank	Rate of compensation	* Services	Travel	Total
Guy Moulton	Division engineer	$4,800 per year	$520 00	$19 61	$539 61
H. C. Smith	Senior assistant engineer	2,820 per year	2,966 88	160 49	3,127 37
DeWitt H. Daley	Senior assistant engineer	3,000 per year	135 73	....	135 73
H. C. Allen	Consulting engineer	60 per day	60 00	1 50	61 50
Harvey Wagner	Stenographer	1,500 per year	137 50	....	137 50
L. L. Hadley	Assistant engineer	2,340 per year	2,192 24	245 72	2,437 96
C. L. Bannister	Assistant engineer	2,580 per year	215 00	....	215 00
R. Sturtevant	Assistant engineer	2,580 per year	114 44	31 77	146 21
J. H. O'Donnell	Assistant engineer	2,580 per year	95 81	....	95 81
C. F. Hopstein	Junior assistant engineer	1,800 per year	21 82	7 76	29 58
L. B. Westfall	Junior assistant engineer	1,800 per year	42 50	....	42 50
H. L. Drake	Junior assistant engineer	1,500 per year	1,396 50	5 80	1,402 30
A. Moosbrugger	Engineering assistant	1,080 per year	10 61	11 39	22 00
Jos. Duffy	Engineering assistant	1,080 per year	47 90	....	47 90
E. F. Allen	Laborer	2 50 per day	363 00	....	363 00
Wm. S. Philo	Laborer	2 50 per day	863 50	....	863 50
Frank Waldo	Laborer	2 50 per day	145 75	....	145 75
C. W. Chase	Chauffeur	1,500 per year	125 00	17 65	142 65
M. Sheridan	Telephone operator	1,080 per year	115 50	....	115 50
T. C. McNicholas	Gage reader	84 per year	84 00	....	84 00
C. N. Bacon	Gage reader	60 per year	55 00	....	55 00

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Cayuga and Seneca Canal — (Cont'd)

Chapter 391, Laws of 1909, and amendatory laws

NAME	Rank	Rate of compensation	*Services	Travel	Total
E. F. Garbus	Gage reader	$60 per year	$55 00		$55 00
Wm. H. Lane	Gage reader	60 per year	60 00		60 00
C. D. Martin	Gage reader	60 per year	55 00		55 00
Timothy Regan	Gage reader	60 per year	55 00		55 00
Fred Wright	Gage reader	60 per year	60 00		60 00
A. M. Smith	Livery			$40 00	40 00
D. M. Kellogg	Livery			28 00	28 00
			$9,993 68	$569 69	$10,563 37
Incidental Expenses					
Office rent				$192 00	
Fuel and light				8 00	
Stationery and printing				83 36	
Postage				16 40	
Telephone and telegraph				76 35	
Miscellaneous				138 14	
					514 25
Total					$11,077 62

Construction of Barge Canal Terminals

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	*Services	Travel	Total
Guy Moulton	Division engineer	$4,800 per year	$960 00	$5 65	$965 65
E. J. Berry	Senior assistant engineer	3,300 per year	609 94	1 90	611 84
L. J. Mulhauser	Stenographer	1,500 per year	600 48	2 67	603 15
Harvey Wagner	Stenographer	1,500 per year	250 00		250 00
A. G. Card	Assistant engineer	2,580 per year	2,364 52	33 68	2,398 20
C. L. Bannister	Assistant engineer	2,580 per year	1,612 50		1,612 50
W. J. Durkan	Assistant engineer	2,580 per year	1,189 30	100 06	1,289 36
Geo. H. Haley	Assistant engineer	2,580 per year	1,378 41	25 47	1,403 88
L. Bartlett	Assistant engineer	2,580 per year	660 56	14 73	675 29
Geo. H. Briggs	Assistant engineer	2,580 per year	34 68		34 68
I. S. Badger	Assistant engineer	2,580 per year	633 21	3 77	636 98
H. H. Brown	Assistant engineer	2,580 per year	13 87		13 87
J. E. Smith	Junior assistant engineer	1,800 per year	1,248 84		1,248 84
C. F. Hopstein	Junior assistant engineer	1,800 per year	5 50	11 05	16 55
G. L. Stillman	Junior assistant engineer	1,680 per year	548 21		548 21
Geo. H. Thomas	Junior assistant engineer	1,800 per year	44 00		44 00
C. L. Fox	Junior assistant engineer	1,680 per year	321 70		321 70
M. J. Chryst	Junior assistant engineer	1,680 per year	104 71		104 71
J. H. Forth	Junior assistant engineer	1,560 per year	286 00		286 00
H. A. Shafer	Junior assistant engineer	1,560 per year	266 23		266 23
W. J. Bell	Junior assistant engineer	1,200 per year	590 09		590 09
A. Moosbrugger	Engineering assistant	1,080 per year	821 35		821 35
L. A. Kavanagh	Engineering assistant	1,080 per year	301 92		301 92
Frank Lutz	Engineering assistant	1,020 per year	216 76		216 76
Edmund Wilcox	Engineering assistant	840 per year	82 29	4 44	86 73
E. S. Niles, Jr	Engineering assistant	840 per year	7 76		7 76
Gail Bowler	Engineering assistant	840 per year	7 45		7 45
Parnell Maroney	Engineering assistant	840 per year	2 49		2 49
Patrick Ryan	Boatman	3 00 per day	244 20		244 20
Frank Ladd	Boatman	3 00 per day	171 60		171 60
Thos. Moran	Boatman	3 00 per day	438 90		438 90
R. D. Smith	Laborer	2 50 per day	792 00		792 00
Patrick Hickey	Laborer	2 50 per day	140 25		140 25

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal Terminals — (Continued)

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	*Services	Travel	Total
D. W. Traub	Laborer	$2 50 per day	$22 00	....	$22 00
C. W. Chase	Chauffeur	1,500 per year	400 00	$5 75	405 75
M. Sheridan	Telephone operator	840 per year	192 50	....	192 50
Catherine Donnelly	Telephone operator	840 per year	14 68	....	14 68
John Connors	Janitor	1,200 per year	55 00	....	55 00
C. H. Osterhout	Fireman	900 per year	168 39	....	168 39
			$17,802 29	$209 17	$18,011 46
Incidental Expenses					
Office rent				$70 00	
Fuel and light				122 75	
Stationery and printing				23 75	
Postage				80 89	
Telephone and telegraph				131 63	
Miscellaneous				324 71	
					753 73
Total					$18,765 19

Glen Creek Improvement

Chapter 341, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
C. F. Hopstein	Junior assistant engineer	$1,800 per year	$29 03	$55 36	$84 39
E. L. Keeler	Junior assistant engineer	1,800 per year	14 51	....	14 51
J. J. Ryan	Junior assistant engineer	1,800 per year	14 52	....	14 52
Gail Bowler	Engineering assistant	840 per year	7 45	....	7 45
Total			$65 51	$55 36	$120 87

Construction of Dive Culvert, Rome

Chapter 346, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
Foster B. Crocker	Assistant engineer	$2,580 per year	$23 65	....	$23 65
Daniel Scanlon	Engineering assistant	1,080 per year	9 90	....	9 90
Frank Brophy	Laborer	2 50 per day	8 25	....	8 25
			$41 80		$41 80
Incidental Expenses					
Stationery and printing				$57 69	
Miscellaneous				1 40	
					59 09
Total					$100 89

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Lake Street Bridge, Geneva

Chapter 351, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
L. L. Hadley	Assistant engineer	$2,340 per year	$212 76	$19 51	$232 27
H. C. Smith	Junior assistant engineer	1,680 per year	122 10		122 10
			$334 86	$19 51	$354 37
	Incidental Expenses				
Stationery and printing					71 04
Total					$425 41

Construction of Minetto Bridge

Chapter 716, Laws of 1915

NAME	Rank	Rate of compensation	*Services	Travel	Total
E. M. Ellis	Assistant engineer	$2,580 per year	$745 22	$22 02	$767 24
I. S. Badger	Assistant engineer	2,580 per year	236 50		236 50
Chas. Smith	Laborer	2 50 per day	280 50		280 50
			$1,262 22	$22 02	$1,284 24
	Incidental Expenses				
Fuel and light				$17 60	
Livery				18 00	
Telephone and telegraph				44 70	
Postage				2 28	
Miscellaneous				4 38	
					86 96
Total					$1,371 20

Limestone Creek Improvement

Chapter 751, Laws of 1917

NAME	Rank	Rate of compensation	*Services	Travel	Total
W. J. Durkan	Assistant engineer	$2,580 per year	$7 88	$0 40	$8 28
C. F. Hopstein	Junior assistant engineer	1,800 per year	5 50	40	5 90
Total			$13 38	$0 80	$14 18

* Includes additional compensation of 10 per cent allowed above base rate.

Canandaigua Lake Dredging

Chapter 756, Laws of 1917

NAME	Rank	Rate of compensation	*Services	Travel	Total
Guy Moulton	Division engineer	$4,800 per year	....	$6 14	$6 14
H. C. Smith	Senior assistant engineer	2,820 per year	$64 62	24 00	88 62
H. H. Brown	Assistant engineer	2,580 per year	25 20	....	25 20
L. L. Hadley	Assistant engineer	2,340 per year	147 98	....	147 98
I. S. Badger	Assistant engineer	2,580 per year	236 50	....	236 50
C. F. Hopstein	Junior assistant engineer	1,800 per year	63 39	3 17	66 56
E. L. Keeler	Junior assistant engineer	1,800 per year	4 84	18 72	23 56
H. L. Drake	Junior assistant engineer	1,680 per year	343 04	52 96	396 00
Patrick Ryan	Boatman	3 00 per day	3 30	....	3 30
L. G. Hyle	Laborer	2 50 per day	2 75	....	2 75
W. S. Morris	Estimate clerk	2,100 per year	....	6 14	6 14
C. W. Chase	Chauffeur	1,500 per year	....	1 00	1 00
Total			$891 62	$112 13	$1,003 75

Cowasselon Creek Dredging

Chapter 781, Laws of 1917

NAME	Rank	Rate of compensation	*Services	Travel	Total
E. J. Berry	Senior assistant engineer	$3,300 per year	....	$1 36	$1 36
W. J. Durkan	Assistant engineer	2,580 per year	$7 63	....	7 63
D. R. Lee	Assistant engineer	2,340 per year	217 16	27 00	244 16
E. L. Keeler	Junior assistant engineer	1,800 per year	19 35	....	19 35
J. J. Ryan	Junior assistant engineer	1,800 per year	51 13	....	51 13
C. F. Hopstein	Junior assistant engineer	1,800 per year	4 84	....	4 84
Patrick Ryan	Boatman	3 00 per day	23 10	....	23 10
L. G. Hyle	Laborer	2 50 per day	16 50	....	16 50
W. H. Benson	Laborer	2 50 per day	8 25	....	8 25
E. S. Niles, Jr.	Laborer	2 50 per day	5 50	....	5 50
			$353 46	$28 36	$381 82
Incidental Expenses					
Postage				$0 83	
Livery				30 00	
Miscellaneous				6 50	
					37 33
Total					$419 15

Construction of Whitesboro Street Bridge, Rome

Chapter 753, Laws of 1917

NAME	Rank	Rate of compensation	*Services	Travel	Total
E. J. Berry	Senior assistant engineer	$3,300 per year	....	$4 40	$4 40
W. J. Durkan	Assistant engineer	2,580 per year	$1,026 88	141 14	1,168 02
E. L. Keeler	Junior assistant engineer	1,800 per year	9 68	....	9 68
C. F. Hopstein	Junior assistant engineer	1,800 per year	5 50	1 90	7 40
H. R. Horton	Junior assistant engineer	1,200 per year	62 85	....	62 85
Patrick Ryan	Boatman	3 00 per day	3 30	....	3 30
L. G. Hyle	Laborer	2 50 per day	8 25	....	8 25
			$1,116 46	$147 44	$1,263 90
Incidental Expenses					
Telephone and telegraph				$0 40	
Miscellaneous				60 30	
					60 70
Total					$1,324 60

* Includes additional compensation of 10 per cent allowed above base rate.

Blue Line Surveys — Erie Canal

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
E. J. Berry	Senior assistant engineer	$3,300 per year	$163 41	$1 50	$164 91
R. K. Sheldon	Assistant engineer	2,580 per year	2,040 99	475 15	2,516 14
C. W. Costello	Assistant engineer	2,580 per year	1,419 00	13 92	1,432 92
E. M. Ellis	Assistant engineer	2,580 per year	989 64	607 77	1,597 41
A. G. Card	Assistant engineer	2,580 per year	386 09	120 58	506 67
C. L. Bannister	Assistant engineer	2,580 per year	236 50	....	236 50
D. R. Lee	Assistant engineer	2,340 per year	2,063 33	....	2,063 33
J. Otis Burt	Assistant engineer	1,980 per year	298 06	142 45	440 51
C. Ballard Taylor	Expert	25 00 per day	250 00	....	250 00
J. J. Ryan	Junior assistant engineer	1,800 per year	1,379 59	....	1,379 59
J. E. Smith	Junior assistant engineer	1,800 per year	537 13	....	537 13
E. L. Keeler	Junior assistant engineer	1,800 per year	574 84	....	574 84
G. L. Stillman	Junior assistant engineer	1,680 per year	821 99	....	821 99
M. J. Chryst	Junior assistant engineer	1,680 per year	50 74	....	50 74
L. H. Coit	Junior assistant engineer	1,680 per year	33 37	36 12	69 49
D. B. Lynch	Junior assistant engineer	1,560 per year	77 42	....	77 42
J. S. Bierhardt	Junior assistant engineer	1,440 per year	44 36	....	44 36
D. D. Rogers	Junior assistant engineer	1,200 per year	622 92	....	622 92
A. H. Betts	Junior assistant engineer	1,200 per year	29 35	....	29 35
H. R. Horton	Junior assistant engineer	1,200 per year	17 74	....	17 74
R. M. R. Howard	Junior assistant engineer	1,200 per year	61 79	....	61 79
A. Moosbrugger	Engineering assistant	1,080 per year	263 12	....	263 12
L. Kavanagh	Engineering assistant	1,080 per year	9 58	....	9 58
E. D. Pieri	Engineering assistant	840 per year	223 55	....	223 55
W. H. Benson	Engineering assistant	840 per year	122 54	....	122 54
L. E. Jenkins	Engineering assistant	840 per year	45 16	....	45 16
E. M. Wilson	Engineering assistant	840 per year	108 38	....	108 38
E. S. Niles, Jr.	Engineering assistant	840 per year	108 68	4 44	113 12
Gail Bowler	Engineering assistant	840 per year	66 04	....	66 04
Parnell Maroney	Engineering assistant	840 per year	434 94	....	434 94
Patrick Ryan	Boatman	3 00 per day	310 20	....	310 20
Frank Brophy	Laborer	2 50 per day	110 00	....	110 00
D. W. Traub	Laborer	2 50 per day	68 75	....	68 75
C. P. Plummer	Laborer	2 50 per day	55 00	....	55 00
L. G. Hyle	Laborer	2 50 per day	19 25	....	19 25
E. S. Niles, Jr.	Laborer	2 50 per day	11 00	....	11 00
			$14,054 45	$1,401 93	$15,456 38
Incidental Expenses					
Livery				$982 25	
Postage				48 84	
Telephone and telegraph				6 45	
Miscellaneous				622 22	
					1,659 76
Total					$17,116 14

Blue Line Surveys — Oswego Canal

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
E. J. Berry	Senior assistant engineer	$3,300 per year	$53 22	$1 00	$54 22
R. K. Sheldon	Assistant engineer	2,580 per year	62 42	14 00	76 42
J. J. Ryan	Junior assistant engineer	1,800 per year	43 55	....	43 55
R. J. Storm	Junior assistant engineer	1,200 per year	14 19	3 08	17 27
E. D. Pieri	Engineering assistant	840 per year	22 35	....	22 35
W. H. Benson	Engineering assistant	840 per year	20 32	....	20 32
			$216 05	$18 08	$234 13
Incidental Expenses					
Livery					32 00
Total					$266 13

* Includes additional compensation of 10 per cent allowed above base rate.

Surveys for State Court of Claims — Erie Canal

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
Geo. H. Briggs	Assistant engineer	$2,580 per year	$501 80	....	$501 80
D. R. Lee	Assistant engineer	2,340 per year	62 90	....	62 90
Geo. H. Thomas	Junior assistant engineer	1,800 per year	976 43	$135 18	1,111 61
C. F. Hopstein	Junior assistant engineer	1,800 per year	10 65	6 84	17 49
M. J. Chryst	Junior assistant engineer	1,680 per year	9 22	....	9 22
H. R. Horton	Junior assistant engineer	1,200 per year	7 10	....	7 10
L. A. Kavanagh	Engineering assistant	1,080 per year	125 39	....	125 39
Gail Bowler	Engineering assistant	840 per year	4 97	....	4 97
			$1,698 46	$142 02	$1,840 48
Incidental Expenses					
Livery				$512 00	
Stationery and printing				60	
Postage				40 00	
Telephone and telegraph				1 25	
Miscellaneous				99 96	
					653 81
Total					$2,494 29

Survey for Hospital Development Commission — Utica State Hospital, Marcy Division

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
Lewis Bartlett	Assistant engineer	$2,580 per year	$845 30	$357 68	$1,202 98
George H. Thomas	Junior assistant engineer	1,800 per year	33 65	....	33 65
L. H. Coit	Junior assistant engineer	1,680 per year	305 80	....	305 80
G. L. Stillman	Junior assistant engineer	1,680 per year	27 50	....	27 50
L. Kavanagh	Engineering assistant	1,080 per year	49 91	....	49 91
Frank Lutz	Engineering assistant	1,020 per year	28 44	....	28 44
Gail Bowler	Engineering assistant	840 per year	78 13	....	78 13
C. P. Plummer	Laborer	2 50 per day	66 00	....	66 00
Total	....	....	$1,434 73	$357 68	$1,792 41

* Includes additional compensation of 10 per cent allowed above base rate.

SUMMARY

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals

1. Erie canal, chapter 151, Laws of 1918	$9,754 55
2. Black River canal, chapter 151, Laws of 1918	230 37

Construction of Barge Canal

3. Erie canal, chapter 147, Laws of 1903, and amendatory laws	48,060 81
4. Oswego canal, chapter 147, Laws of 1903, and amendatory laws	16,651 74
5. Cayuga and Seneca canal, chapter 391, Laws of 1909, and amendatory laws	11,077 62

Construction of Barge Canal Terminals

6. Barge canal terminals, chapter 746, Laws of 1911, and amendatory laws	18,765 19

Special Work

7. Glen creek improvement, chapter 341, Laws of 1918	120 87
8. Dive culvert, Rome, chapter 346, Laws of 1918	100 89
9. Lake street bridge, Geneva, chapter 351, Laws of 1918	425 41
10. Minetto bridge, chapter 716, Laws of 1915	1,871 20
11. Limestone creek improvement, chapter 751, Laws of 1917	14 18
12. Canandaigua Lake dredging, chapter 756, Laws of 1917	1,003 75
13. Cowaselon creek, dredging, chapter 781, Laws of 1917	419 15
14. Whitesboro street bridge, Rome, chapter 753, Laws of 1917	1,324 60

Special Surveys

15. Blue line surveys, Erie canal, chapter 151, Laws of 1918	17,116 14
16. Blue line surveys, Oswego canal, chapter 151, Laws of 1918	266 13
17. Surveys for State Court of Claims, Erie canal, chapter 151, Laws of 1918	2,494 29
18. Survey for Hospital Development Commission — Utica State hospital, Marcy division, chapter 151, Laws of 1918	1,792 41
Total	$130,989 30

REPORT

OF THE

DIVISION ENGINEER

OF THE

WESTERN DIVISION

For the Fiscal Year Ended June 30, 1919

WESTERN DIVISION

State of New York

Department of State Engineer and Surveyor

Western Division

Rochester, N. Y., *July* 1, 1919.

Hon. Frank M. Williams, *State Engineer and Surveyor, Albany, N. Y.:*

Sir.— I have the honor of submitting herewith a report covering the work of the Western Division for the fiscal year ended June 30, 1919.

On December 31, Mr. F. P. Williams, Division Engineer since April 1, 1914, resigned to accept your appointment as Special Deputy State Engineer. The last half of the fiscal year the activities of the Division have been under my supervision.

About 70 per cent of the improved canal within the limits of the Western Division follows the old Erie canal. The necessity of maintaining traffic through the old canal while the enlargement was under way retarded construction, in some instances limiting it to the closed season. There were also delays in arriving at agreements for railroad crossings and in determining a location which would best fulfill the requirements of the city of Rochester. When, in 1915, it became necessary to suspend the awarding of contracts on account of the exhaustion of the original one hundred and one million dollar appropriation, there were certain sections in this Division not under contract. The interval during which the awarding of contracts for the uncompleted sections was held up delayed the opening of the improved canal through the Western Division beyond the date when it was opened through the Middle and Eastern Divisions. As soon as additional funds (provided by chapter 570, Laws of 1915) were made available, work was energetically pushed and the beginning of the fiscal year just closed found boats passing the entire length of the new

canal. But, in order to open the waterway at the earliest possible time, some sections were not excavated to full width and unessential structural details were omitted. It is the completion of such work, together with the construction of Rochester harbor and terminal facilities at Buffalo and operations at various points along the improved canal, which has constituted the principal part of the work of the Division during the year.

Special appropriations for eight different projects have also required surveys or inspective supervision by employees of this department. Of these the blue line surveys have required the major portion of time. Up to the present year blue line surveys in the Western Division have received only intermittent attention, but with the prospect that men and funds would be available to push the work to completion this year it was placed in charge of a Senior Assistant Engineer and men are being assigned to the work as rapidly as they can be released from construction. Ellicott creek improvement at Tonawanda and Hertel avenue bridge over the Erie canal at Buffalo have required a small party. The Chadakoin river improvement at Jamestown, Eighteen-Mile creek culvert at Lockport and Griffin creek improvement at Cuba, have required an occasional day's assignment. Numerous surveys, maps, reports and investigations have been made in connection with claims which have been filed against the State. Two surveys in connection with applications for grants of lands under water in the Niagara river have been made.

The State-owned lands along the water-front are increasing in value each year as the hydraulic power-supply is becoming more extensive and navigation facilities are increased. Applications for grants which have been made during recent years have required surveys covering the water-front from Buffalo creek southwesterly to Lackawanna and also about three of the twenty-five miles of river-front between Buffalo creek and Niagara Falls. The method of surveying individual, isolated parcels, as grants are requested, is not as satisfactory as it would be to make a continuous survey. Much of the work consists in retracing old shore lines, and this can be done with greater accuracy if carried through long sections. The value of the land is sufficient to warrant accurate surveys in determining the bounds of that owned

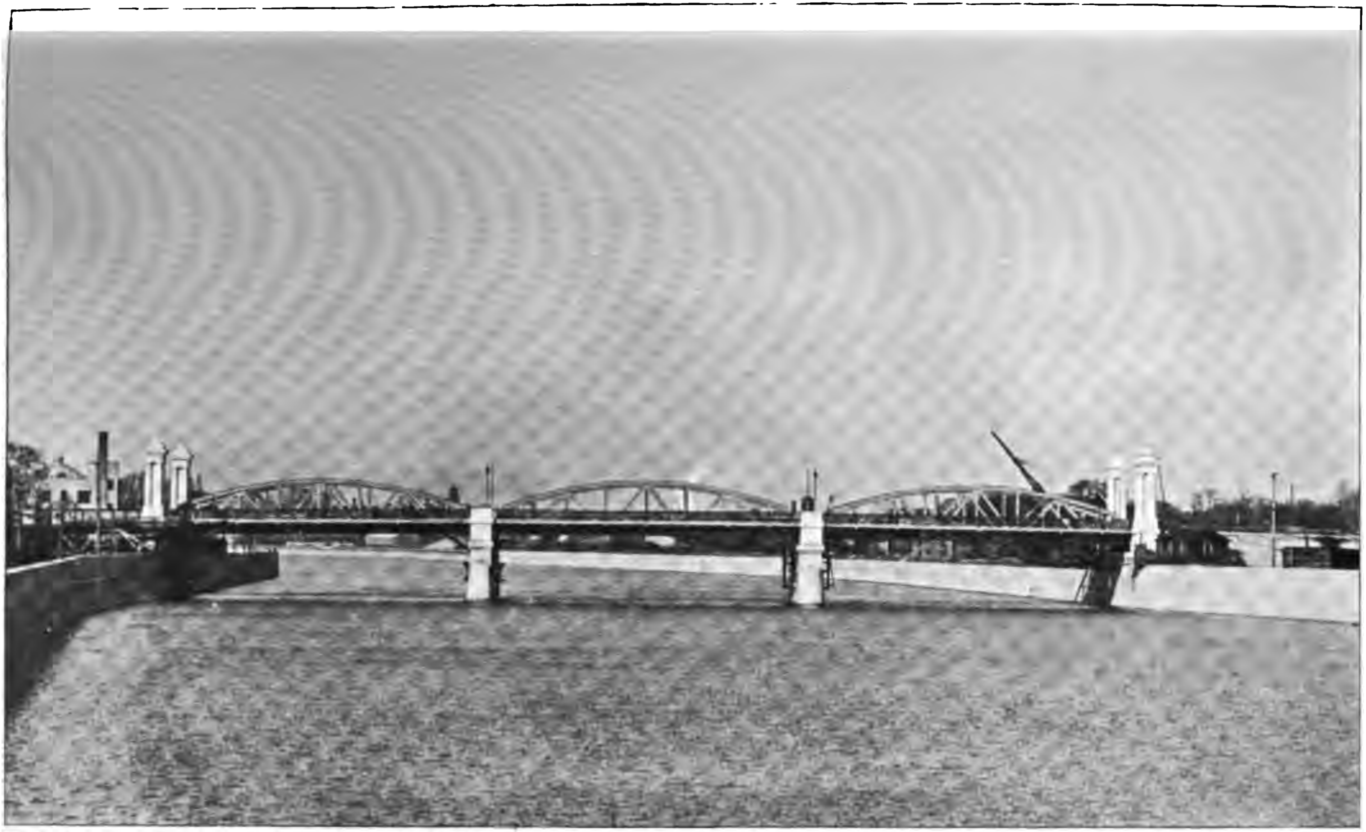
by the State, and if funds can be obtained, I would recommend the making of an accurate survey and map of all State lands along the Niagara river to Niagara Falls and along the lake-front adjacent to the city of Buffalo.

Investigations and reports were made on the condition of the canal channel before the opening of navigation this spring. When possible, this was done in the dry. In sections that were not unwatered, investigations were made by means of a sweep-boat and soundings. Sediment has been deposited at stream entrances and sloughing of the banks has occurred at isolated points. These have not been sufficient seriously to interfere with navigation, but frequent examinations of the channel should be made, since changes are constantly occurring. The sweep-boats used by the Department are rather crude affairs, rigged up for examining small areas, as construction work progressed. These are not adequate for examining long sections of canal, and in order that obstructions may be quickly located and the channel frequently examined, sweep-boats suitable for the work should be added to the equipment.

The canal improvement, to which the major portion of the energies and time of the engineering force has been devoted during the last score of years, has permitted a close study of engineering problems in the territory adjacent to the canals and has furnished valuable data for the intelligent consideration of engineering questions which may be submitted to the State Engineer in his capacity as engineer adviser to the State. Outside of the territory adjacent to the canals, however, there has not been an equal opportunity for the study of engineering problems. There are more or less frequent appropriations by the Legislature for the improvement of creeks and rivers, in order to promote navigation or to avoid the over-flow of banks in flood season, the destruction of valuable property or the menace to health, and also there are occasional calls from heads of State institutions or other departments for surveys and advice in regard to water-supply or sewage works, but in general the acts providing for such miscellaneous construction carry no funds for a continuous study of the problem, and as a consequence the plans for repairs, as well as for original construction, have to be based on

such data as the engineers may be able to gather in a limited time. The lack of adequate information is sometimes a very serious handicap. For example, reports on a new river improvement are occasionally requested at short notice, and in such work the records of flood flows and studies of conditions over a period of years are indispensable to the most efficient and economical expenditure of funds. The intermittent and local character of these special appropriations does not permit a continuous study of the requirements nor an observation of the effect of improvements already made, and as a result the report or engineering advice from this Department cannot be so reliable nor so extensive as might be rendered if funds were available for following up improvements. If construction work already done could be inspected from time to time, to note its effectiveness, it would provide a more intelligent basis for any further expenditures which may be contemplated. I would therefore suggest for your consideration the advisability of procuring a small fund to be allotted for the investigation and study of engineering problems outside of canal territory.

For the purpose of maintaining navigation during the construction of the Rochester harbor, a temporary dam was built in the Genesee river about 3,000 feet below the canal crossing. A rapid rise in the Genesee river, shortly before the opening of navigation this spring, brought down large quantities of trees, logs and heavy drift, which lodged against the boom placed for protection in front of the dam, breaking the boom and passing down to the dam. This material accumulated too rapidly to permit the lowering of the dam and efforts were concentrated on removing the drift. Work was carried on continuously, teams and a traction engine being used to draw the heavy material ashore. The unflagging efforts of the contractor had practically cleared the face of the dam when a second flood occurred, with greater flow. This brought such a pressure against the dam that a portion of the foundation was torn from the bed rock to which it was bolted and about one hundred feet was carried away during the night of May 23. Materials for repairs were assembled and as soon as the water receded to a stage which would permit, cribs, pre-

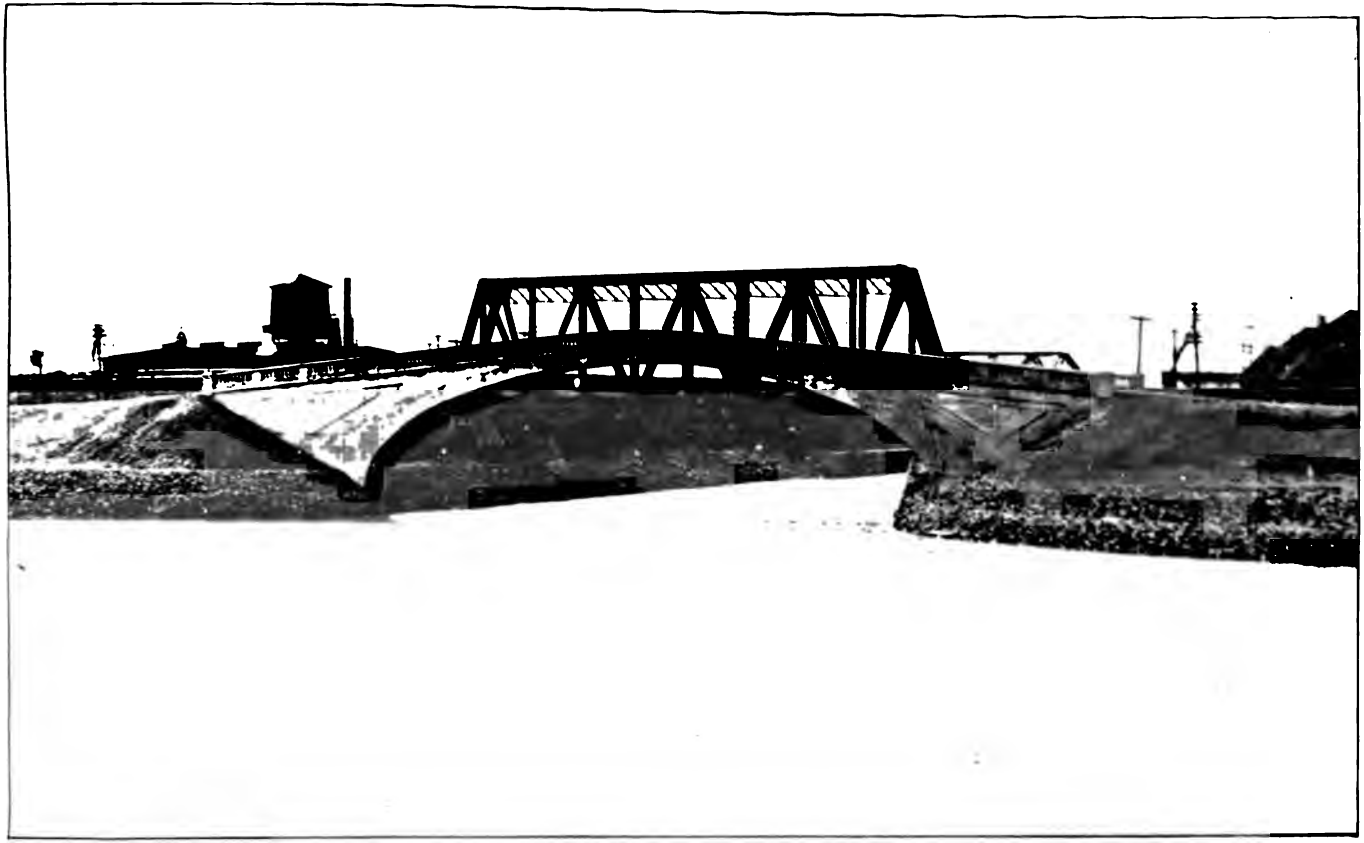


ROCHESTER HARBOR

View looking north, with new Clarissa street bridge in the foreground.

MOVABLE DAM (BRIDGE AND SECTOR GATE TYPES), ROCHESTER

A portion of the old dam is seen at the extreme left. New sections, with crests level with the old dam, replace portions of the old dam removed, so that when the movable dam is opened in the winter, exact former conditions of water-level prevail.



West Side of Genesee River Crossing
The channel runs through Genesee Valley Park in this vicinity and several foot-bridges, like the one in this view, were needed to connect the separated portions of the park.

West Shore Railroad Bridge at Pittsford

This bridge has been recently completed and also the prism excavation at this point (being completed under contract No. 179) has been recently finished.

Auburn Railroad Bridge near Pittsford

Recently completed. Prism excavation in this vicinity being finished under contract No. 179.

Canal Channel in Deep Cut South of Rochester
West Henrietta road bridge, wash wall and a stream entrance are shown.

ROCHESTER HARBOR
Construction of west river wall south of Clarissa street.

ROCHESTER HARBOR
Construction of west river wall north of Clarissa street.

viously framed, were sunk and ten days later the dam was restored. Canal traffic at the Genesee river crossing was held up a short time by the excessive current from the flood, but repairs to the dam kept pace with the recession of the flood, so that there was no delay from the failure of the dam.

CONSTRUCTION OF BARGE CANAL AND TERMINALS

At the beginning of the fiscal year, with the canal so far completed as to permit the passage of boats, there was not the imperative need for progressing the uncompleted work as an aid to war operations and contractors found it increasingly difficult to obtain materials and labor. However, the work was continued through the summer. After the signing of the armistice, conditions improved and before the end of the year contract work was progressing rapidly.

Fifteen new contracts have been added to the 30 in force at the beginning of the year. Of this total of 45 contracts, 21 were brought to a close during the year and 24 are still active. Thirteen contracts have been placed under the provisions of chapter 585, Laws of 1918. On four of the contracts cancelled under the provisions of that act, agreements have been entered into with the original contractors for the completion of portions of the construction. This Department has had a general supervision of the work.

The only parts of the canal system in the division where traffic is cut off by construction are the Rochester harbor and the Ohio basin at Buffalo.

The Court street dam in the Genesee river at Rochester will be completed before the opening of navigation next season and the Rochester harbor will be open for Barge canal traffic. A channel one hundred feet wide from the canal crossing to deep water at the Erie railroad bridge over the river will provide entrance to the harbor and terminal. Plans are under way for increasing the channel width to two hundred feet.

By the end of the season it is expected that construction at the Ohio basin, Buffalo, will have reached a stage where obstructions in the entrance will be removed and passage opened for boats of 12 feet draft.

Railroad Crossings

On the date of the last report the problem with reference to railroad crossings, which had given so much trouble in the past, was practically solved. The main line crossing east of Lyons, the West Shore and the Auburn crossings at Pittsford and the Erie crossing south of Rochester were just at the point of completion and were reported at that time as finished, although a little work still remained to be done on some of them. Since that time the bridge on the main line across the old abandoned channel of the Clyde river just east of Lyons has been removed. A fill was first made in the old channel under this bridge, then the girders were blocked up, the rivets cut, the superstructure removed and the track ballasted, being brought to grade by November 2. The switch tracks were next ballasted, the right-of-way fences were built and finally the work was accepted on January 22, 1919, by the maintenance department of the railroad.

At the Erie railroad crossing over the main line of the canal south of Rochester the plate girders for the bridge were unloaded from cars and placed on the abutments by September 3, 1918, while the remainder of the steel was stored on the site. The superstructure was completely assembled and riveted and the floor system painted by the middle of October, 1918. Concreting in the floor system was carried to completion, the east track laid across the bridge and ballasted and this track opened to traffic by December 24, 1918. The painting of the remainder of the bridge was done by about the middle of January, 1919. The backfill at both ends of the bridge for the westerly tracks has not been completed nor have tracks been placed across the bridge.

The Pennsylvania main line bridge west of the Genesee river was completed, tracks were laid across and ballasted, and the bridge was thrown open to traffic on August 30, 1918.

On the Rochester harbor work, along the west bank of the Genesee river, the Lehigh Valley Railroad Company has shifted much of its track to temporary locations, thus permitting the construction of the harbor walls and terminal. On the west bank the Erie Railroad Company has temporarily discontinued use of the easterly track so as to permit wall construction in close

proximity to this track, which has been used by the State for construction purposes. While all expenses in this locality are borne by the State, the railroad companies have coöperated in a satisfactory manner.

At Tonawanda the construction of a bascule bridge has been in progress, most of the work on both substructure and superstructure having been done during the past year. Prior to a year ago the railroad company was engaged in building approaches, a work which involved a long detour, the scheme of railroad crossings in this locality having been rearranged so as to eliminate one bridge and carry two roads over a single new bridge.

Clarissa Street Bridge

This bridge is being constructed across the Genesee river by the city of Rochester and is of such design as to provide Barge canal clearance.

Previous to the erection of this bridge the city of Rochester and the State of New York entered into an agreement whereby the State of New York was to contribute toward the cost of the bridge, which the city of Rochester was to erect. The bridge is to be, in design and construction, wider and more costly than the State would have built. The masonry is finished and steel erection is well advanced.

Genesee Valley Canal Sewer Overflows and Wall Construction

During the year the city of Rochester completed two sewer overflows which discharge into the Rochester harbor. These sewer overflows were built in connection with the sewer in the old Genesee Valley canal, which replaced the existing sewer overflows that the city authorities deemed inadequate to meet conditions imposed by Barge canal construction.

The top section of the river walls, provided at the request and expense of the city to guard against extreme flood overflow, has been built simultaneously with the remainder of the structure.

SPECIAL APPROPRIATIONS

Ellicott Creek Improvement

(Chapter 624, Laws of 1913 ($80,000); chapter 728, Laws of 1915; chapters 181 and 760, Laws of 1917 ($55,000); chapter 85, Laws of 1918 ($25,000); chapter 644, Laws of 1919)

Contractor, J. W. Hennessy, Inc., Buffalo, N. Y.

Date of contract, April 18, 1918.

Engineer in charge, R. W. Cady, Assistant Engineer.

Aggregate of appropriations	$160,000.00
Engineer's preliminary estimate	86,803.25
Contractor's bid	86,885.30
Value of work done to June 30, 1919	75,780.00

The first contract under this appropriation was awarded to F. L. Cohen of Buffalo on December 10, 1914. He completed nearly all work of raising or reconstructing bridges, but failed to undertake the prism excavation and his contract was canceled. The contract for completion was let to J. W. Hennessy, Inc., on April 18, 1918, and included, with the channel excavation to Barge canal depth, some retaining wall construction at the west end of the Niagara street bridge, paving of slopes under the bridges, laying concrete sidewalks and placing wrought-iron pipe railing. This contract has now been completed except for removal of snags and clearing, practically all the work having been done during the past year. A clam-shell dredge, supplemented later by a large suction dredge, was used in excavating the prism.

Concrete Culvert Over Eighteen-Mile Creek

(Chapters 181 and 626, Laws of 1917; chapter 644, Laws of 1919)

Contractor, Savage Construction Co., Buffalo, N. Y.

Date of contract, May 31, 1919.

Amount of appropriation	$12,500.00
Engineer's preliminary estimate	10,805.00
Contractor's bid	11,070.50

This contract, which provides for the construction of a concrete culvert over Eighteen-Mile creek eastward from Pound street in the city of Lockport, was first let on January 30, 1918, to Russell R. Ames, Inc., of Rochester, N. Y. With the exception of a little clearing he did nothing and the contract was canceled, therefore, and relet as above. Excavation was begun in late June, 1919, under this new contract.

Chadakoin River (Chautauqua Lake Outlet) Improvement

(Chapter 758, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917; chapter 644, Laws of 1919)

Amount of appropriation, $100,000.00.

A contract for the dredging of sections of river channel at Jamestown and for the construction of a new dam with Taintor gates and raceway intake, in place of Warner's dam, was let on March 23, 1916, to Geo. L. Maltby, of Jamestown, N. Y. On June 18, 1918, this contract was suspended on account of slow progress. During the past year the Superintendent of Public Works has done such work as was necessary to preserve incomplete portions of the contract and to protect the State. Considerable excavation had been done just below Fairmount avenue bridge and the new bulkhead headgates were finished. The Taintor gates have been assembled and riveted, but operating machinery has not been placed. The gates are held open with heavy timber blocking. Water is controlled by temporary timber construction in front of the Taintor gates.

Hertel Avenue Bridge

(Chapter 761, Laws of 1917)

Contractor, Lupfer & Remick, Buffalo, N. Y.

Date of contract, March 15, 1918.

Engineer in charge, E. H. Anderson, Assistant Engineer.

Amount of appropriation	$30,000.00
Engineer's preliminary estimate	27,937.50
Contractor's bid	27,967.20
Final estimate	25,311.20

Work was commenced in March, 1918, and previous to a year ago the excavation had been made for the abutments. This year the abutments were completed and the steel erected, and the contract finished on May 6, 1919.

Griffin Creek Improvement

(Chapter 565, Laws of 1918)

Appropriation, $15,000.00.

This appropriation was made to cover bank protection and removal of silt from the bed of Griffin creek in the village of Cuba so as to relieve adjoining lands from flood damage, the creek having been diverted from its natural course and used formerly as a feeder to the Genesee Valley canal. Plans were prepared for a contract to cover this work, but the Superintendent of Public Works decided to utilize available forces and plant and by this means he extended the Main street bridge to give greater waterway and made some further improvement. The survey work was done by this office, when requested.

Survey of Eighteen-Mile Creek

(Chapter 425, Laws of 1918)

Appropriation, $2,500.00.

This survey extended from the canal at Lockport to Lake Ontario and was made as required, U. S. Deep Waterway maps being utilized as far as possible. The power and property interests along the creek were investigated and hydrographic studies were made, resulting in two sets of estimates, one for improvements necessary to provide for the passage of 500 cubic feet per second of water down the creek channel and the other for the passage of 1,000 cubic feet per second.

Cuba–Olean Highway Bridge

(Chapter 637, Laws of 1919)

Appropriation, $24,000.00.

A survey covering the site of the existing bridge across the outlet channel from the Cuba reservoir has been made for the bureau of bridge design.

PRESERVATION OF OLD RECORDS

In addition to the large number of old and valuable plans on file in this office there are a few manuscript records of historical and legal value, which were in bad condition. Several of these have been typewritten and bound in volumes suitable for reference and preservation, additional copies having been deposited in the Albany office of the State Engineer. Other volumes, containing original maps or documents, have been suitably repaired and rebound. While the Division office has some vault space and a limited amount of partially fire-proof filing cases, it affords no protection to most of the plans and records, and these would probably be lost in the event of a severe fire in the building in which the headquarters are situated. It would be of distinct advantage to have the Division offices housed in a modern fire-proof structure.

The field construction work is now under the supervision of three Senior Assistant Engineers, A. E. Steere, in charge of the eastern end of the Division, B. E. Failing, in charge of the western end of the Division, and A. R. Morse, in charge of construction at the Genesee river crossing and at the Rochester harbor and terminal. Field offices have been closed at Newark and South Greece. The offices which are being maintained are located at Lyons, Pittsford, Rochester, Tonawanda and Buffalo.

During the summer of 1918 the forces of the Division were reduced because of the large number in military service. The "Honor Roll" contains forty-eight names and among these is one casualty, Mr. George H. Yerkes, Mechanic, Company "A," 3d Regiment, 27th Division, who was killed in action September 29, 1918, in the vicinity of St. Quentin during the attack which penetrated the Hindenburg line.

The depletion of the force threw extra work on those who remained. This was cheerfully undertaken and by eliminating vacations and extending hours the work was carried out without delay. Forty men have been discharged from military service and 36 have returned to their former positions in the State service.

In behalf of the employees of the Division and myself, I desire

to express appreciation for the cordial support which has been uniformly extended by you and your deputies and to thank you for the personal consideration which we have received.

Detail reports of the Senior Assistant Engineers in charge of the residencies into which the Division is divided, together with tabulations showing financial statements and disbursements, are appended. In the Senior Assistant Engineers' reports will be found descriptions of the Barge canal and terminal work done during the year.

Respectfully submitted,

L. C. HULBURD,

Division Engineer.

APPENDED REPORTS—WESTERN DIVISION

BLUE LINE SURVEYS

Senior Assistant Engineer L. S. Hulburd reports:

Summary of Previous Work

On July 1, 1918, the following work in this Division had been done:

From Lyons east to the Wayne county line the surveys and maps had been completed and the "1900" base line had been marked with iron pipes from Lyons easterly to Waldorf bridge, about two miles east of Clyde.

In Palmyra village the field surveys and three maps were partially completed.

Through Rochester the maps had been completed and the base line monumented from the junction of the new and old canals west of Pittsford to the junction of the two canals near South Greece.

In the vicinity of Buffalo the field work had been nearly finished, but computations and mapping remained to be done.

Summary of Work during Year

On January 2, 1919, the blue line work was resumed in this Division and has continued through the fiscal year except for interruptions due to the force being temporarily transferred to other work.

A field party began work at Lyons and has worked westerly to Kent street, Palmyra, locating the blue line of the Erie canal where it forms a boundary line of the State's property and marking the points with wrought-iron rods ¾-inch square, and where possible tying these points to near-by structures, trees, poles, etc.

A small force has been engaged in the Rochester office making preliminary computations for the location of the blue line. These computations have been completed from Lyons to a point west of Macedon.

Tracings of the size of field note books were prepared in the office, showing the necessary data for locating the blue line in the

field, and duplicate prints of these were furnished to the field party.

Maps on a scale of 100 feet to the inch, plotted on mounted egg-shell paper, have been nearly finished from Lyons to a point two miles east of Palmyra.

The "1900" base line along the old tow-path was used where possible, as a line from which the blue line points were located. Where the base line had been removed the ties were made to the mounmented offset center line of the improved canal. Preparations have been made for monumenting this base line with concrete monuments.

ERIE CANAL, RESIDENCY NO. 8

Senior Assistant Engineer A. E. Steere reports:

The construction work on this residency comprises the following contracts: Contracts Nos. 47-A, 84, 141, 148, 159 and 164, and part of 172, and terminal contract No. 31 and part of No. 106. In conjunction with the construction work various reports were made on claims arising on account of overflowage, seepage from canal banks, etc. A survey, plans and estimate were completed for grading a highway around lock No. 28-A, known as contract No. 198.

This residency was in charge of L. S. Hulburd, Senior Assistant Engineer, until September 5, 1918, at which time he entered the Federal military service; since that date it has been under the supervision of the writer.

Contract No. 47-A — Special Agreement

Under a resolution of the Canal Board dated March 27, 1917, the Superintendent of Public Works proceeded to complete contract No. 47-A, which was for completing the construction of the canal from the town line about five miles southeast of the village of Clyde to a point near the New York Central railroad crossing at Lyons. The final estimate, amounting to $917,880.30, was approved by the Canal Board January 29, 1919.

F. W. Madigan, Assistant Engineer, was in charge.

This contract had been substantially completed during the previous year, only a few minor features remaining to be done.

During the past year the channel was swept, stream entrances completed at the "Y" bridge and at Sta. 6492, riprap placed at Creeger's bridge abutments, backfill placed behind about 100 linear feet of the West Shore wall and drainage ditches excavated through the spoil-banks between the West Shore railroad culverts and the canal bank. These ditches were completed on August 12, and later in the year were cleaned and the sides sloped, concluding work on the contract.

Contract No. 84

This contract is for constructing portions of a viaduct over the Clyde river and railroad tracks at Clyde. It was awarded to Lupfer & Remick, being signed on March 9, 1917. Construction work began March 2, 1917. The engineer's preliminary estimate was $83,984.50, the contractor's bid, $80,661.80. The contract price as modified by alterations Nos. 1, 2, and 3 is $83,078.66.

J. A. Sloat, Junior Assistant Engineer, was in charge to November 16, 1918, F. W. Madigan, Assistant Engineer, from November 16, 1918, to date.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on December 27, 1918. The cancelation became effective March 19, 1919, upon approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to March 19, 1919, was $81,944.72, and payment of balance due on this amount was authorized by the Canal Board on May 7, 1919. The final account for work done prior to April 7, 1917, amounting to $7,445.65, was approved by the Canal Board on May 7, 1919. The amount paid on extra work orders to date is $2,000.00.

An extra work order dated September 10, 1918, which provides for removing a portion of the filling back of the south abutment of the viaduct and replacing it with material satisfactory for road purposes has been completed.

During the year the erection and riveting of the bridge superstructure was completed. Also the lattice railing on the bridge and both approaches was placed and aligned. The placing and rolling of embankment for the north and south approaches were completed.

The concrete gutter and curb for the north approach were practically completed. Also the bottom course of macadam was placed and rolled on both north and south approaches. The reinforced concrete floor and sidewalk were completed during the last days of December and forms removed. Gravel surfacing was placed on the the Orchard street approach, while gravel was delivered and stored on the site for completing the approach west of the north approach. Brick, sand and crushed stone were delivered in sufficient quantities to complete the paving and the top course of the macadam.

Under chapter 585, Laws of 1918, by a resolution of the Canal Board dated December 27, 1918, authority was given the State Engineer to expend not to exceed $3,000.00 to complete the work remaining on this contract. This resolution was amended on June 25, so that the amount to be expended was increased from $3,000.00 to $3,800.00. The work coming under this order consisted in completing brick pavement and sidewalks, in placing channel lamps, macadam and gravel on approaches, in general grading and in painting the superstructure. The forces of the State Engineer's Department have finished the uncompleted work, except the painting of the superstructure and the placing of a small amount of gravel surfacing around the north approach.

Contract No. 148

This contract is for constructing the substructure, superstructure and approaches of a highway bridge across lock No. 27 and the Clyde river at Leach street, Lyons. It was awarded to Lathrop, Shea & Henwood Co., being signed on September 5, 1917. The engineer's preliminary estimate was $65,810.60, the contractor's bid, $66,986.20. The value of work done during the year is $49,170.00, total done to date, $56,440.00.

F. W. Madigan, Assistant Engineer, is in charge.

An extra work order dated September 13, 1918, provides for grading an approach from the tow-path to Leach street bridge approach; also removing a partly destroyed building.

During the year excavation was made for and concrete was placed in the north and south abutments; also concrete was placed in two arch openings that support the rocker bents on the south lock wall.

Excavation was made and embankment placed for the north and south approaches to the bridge, but at the close of the year these are in an incomplete state. A portion of the south approach. adjacent to the Canandaigua outlet spillway, was undermined and washed away by the spring floods and has not as yet been restored to finished lines.

The erection of the south span of the bridge superstructure was started on April 16, reaching the lock wall on May 6. The girders, floor system, portals and wind-bracing were bolted in place by May 20. Riveting began on May 23, and was completed on June 13. At the close of the year painting was about 70 per cent completed. The lower floor timbers, nailing strips, etc., were also in place.

Contract No. 164

This contract is for completing the construction of the canal at certain locations between Lyons and Newark and for constructing a retaining dam at Macedon. It was awarded to Lathrop, Shea & Henwood Co., being signed on October 30, 1917. Construction work began November 8, 1917. The engineer's preliminary estimate was $124,313.00, the contractor's bid, $159,848.25. The contract price as modified by alteration No. 1 is $115,728.75. Excess steel sheet-piling to the value of $7,550.00, has been authorized by the Canal Board. The value of work done during the year is $22,700.00, total done to date, $104,680.00. The amount paid on extra work orders during the year is $94,961.85, total to date, $94,961.85.

W. W. Brown, Assistant Engineer, was in charge to June 1, 1919, F. W. Madigan, Assistant Engineer, since that date.

Alteration No. 1, approved by Canal Board December 4, 1918, provides for eliminating the construction of the retaining dam at Macedon, the remaining prism excavation at the West Shore and New York Central railroad crossings, and the remaining excavation and embankment near Hill's loop. It decreases the contract price by $44,119.50.

An extra work order dated December 1, 1917, provides for installing in the spillway above lock No. 28-A, a 3-ft. by 3-ft. sluice gate. The final account, amounting to $1,500.00, was approved by the Canal Board July 24, 1918.

An extra work order dated April 26, 1918, provides for furnishing and driving 50 feet of 16-foot steel piling in the vicinity of Sta. 6646. The final account, amounting to $1,834.32, was approved by the Canal Board September 24, 1918.

An extra work order dated May 24, 1919, provides for stopping the seepage and reinforcing the canal banks at certain points, and incidental work in connection therewith. The final account, amounting to $7,126.39, was approved by the Canal Board September 24, 1918.

An extra work order dated December 5, 1918, provides for placing riprap below the dam at lock No. 27 and on the slope west of lock No. 28-A, for completing excavation at Hill's loop, New York Central and West Shore crossings and for constructing a spillway at Macedon.

All of these extra work orders have been completed. The work order of December 5, 1918, was completed on June 17, 1919, work having been carried on throughout the winter months.

During the navigation season of 1918, construction work comprised grading and placing of gravel surfacing on the road approach near the Wayne County Home, work being partly finished. Settled canal embankments were raised and stone for wash wall was loosened from the old canal and cast upon the towpath. Work of completing the canal prism at the old canal crossings at Stas. 6680 and 6738 was resumed in April and completed in June. The canal bank west of lock No. 27, also the drainage ditch and canal bank west of lock No. 28-A were completed. A small amount of work on this contract remains to be done at the close of the fiscal year.

Contract No. 159

This contract is for placing embankment on the north canal bank between Newark and Palmyra and extending Ganargua creek spillway. It was awarded to I. M. Ludington's Sons, Inc., being signed on March 27, 1917. Construction work began April 9, 1917. The engineer's preliminary estimate was $30,464.00, the contractor's bid, $28,476.00. The contract price as modified by alterations Nos. 1, 2 and 3 is $43,258.50.

R. W. Cady, Assistant Engineer, was in charge to July, 1917,

H. A. Helling, Assistant Engineer, from July to October, 1917, H. R. Topping, Junior Assistant Engineer, from October, 1917, to April, 1918, and W. W. Brown, Assistant Engineer, since April, 1918.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective August 14, 1918, upon approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from August 7, 1917, to August 14, 1918, was $40,002.99, and payment of balance due on this amount was authorized by the Canal Board on February 13, 1919.

This contract has been completed and the total payment, including extra work orders, was $40,684.26.

The work in progress on this contract during the fiscal year comprised excavation and placing of third-class riprap below the spillway, driving a small amount of wooden and steel sheet-piling and placing of second-class concrete and wash wall.

Contract No. 141

This contract is for constructing a new power-station at lock No. 29, Palmyra. It was awarded to W. F. Maas & Son, being signed on March 8, 1917. Construction work began April 2, 1917. The engineer's preliminary estimate was $41,166.50, the contractor's bid, $41,180.75.

R. W. Cady, H. A. Helling, Assistant Engineers, and H. R. Topping, Junior Assistant Engineer, have been in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective August 31, 1918, upon approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 31, 1918, was $24,956.58, and payment of balance due on this amount was authorized by the Canal Board on May 7, 1919. The total payment, including extra work orders, was $25,221.79.

No contract work was performed during the past fiscal year.

Purchase of a storehouse was authorized by the Canal Board on December 27, 1918. The final account, amounting to $265.21, was approved by the Canal Board February 13, 1919.

Contract No. 172

This contract is for furnishing and delivering barrel buoys, and lamp-posts for aids to navigation on the Seneca, Clyde, Genesee and Tonawanda rivers. It was awarded to Lupfer & Remick, being signed on March 15, 1918. The engineer's preliminary estimate was $14,853.00, the contractor's bid, $13,063.20. The contract price as modified by alteration No. 1 is $12,921.45. The work was accepted September 24, 1918, and the final account, amounting to $12,913.35, was approved by the Canal Board September 24, 1918.

J. A. Sloat, Junior Assistant Engineer, was in charge.

The portion of the contract affecting this residency provided for furnishing and delivering 23 red and 25 black lamp-posts at Lyons for the Clyde river.

Construction on this residency was completed prior to a year ago. The final estimate for work done on this residency amounted to $379.20.

Terminal Contract No. 31 — *Lyons*

This contract is for constructing a dockwall and an approach at Lyons. It was awarded to Lupfer & Remick, being signed on September 30, 1916. Construction work began September 27, 1916. The engineer's preliminary estimate was $57,925.00, the contractor's bid, $51,653.80.

F. W. Madigan, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on August 14, 1918. The cancelation became effective December 27, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to December 27, 1918, was $44,694.54, and payment of balance due on this amount was authorized by the Canal Board on April 16, 1919. The final account for work done prior to April 7, 1917, amounting to $11,826.55, was approved by the Canal Board on April 2, 1919.

VIADUCT AT CLYDE

This viaduct, built partly by the State and partly by the railroads, crosses the canalized Clyde river, the New York Central and the West Shore tracks, and village streets. By itsconstruction two railroad grade crossings were eliminated. The view is up the approach from the N. Y. C. R. R. station.

LEACH STREET BRIDGE, LYONS

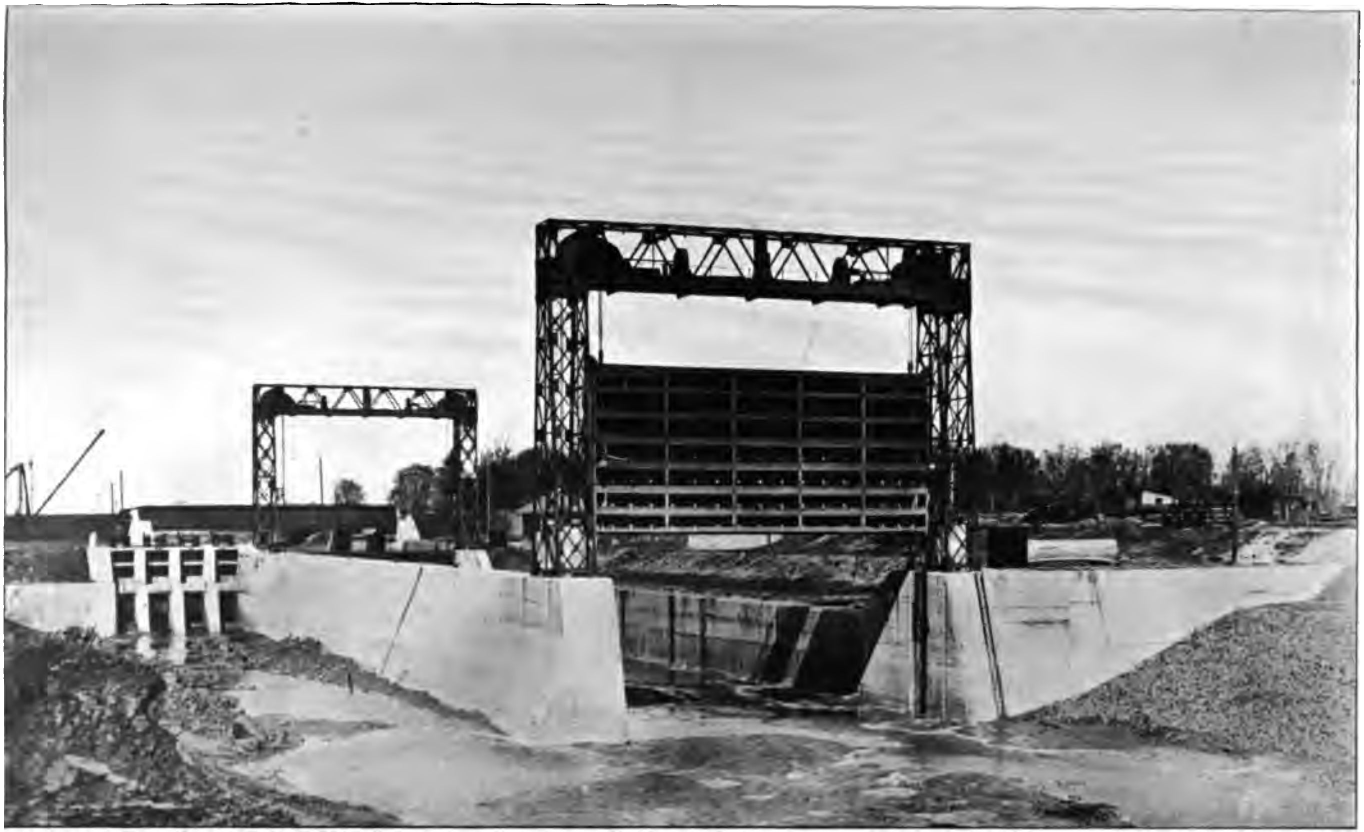
This bridge spans Lock No. 27 and the adjacent stream. Here Canandaigua outlet, seen coming in at the left, and Ganargua creek unite to form the Clyde river.

Canal Structures at Lyons

Lock No. 27 (at the extreme right), two Taintor gates and spillway, passing surplus waters of Ganargua creek, power-house, Leach street bridge and beyond it the R. S. & E. electric railway bridge.

GUARD-GATE ACROSS THE BARGE CANAL

There are several places on the canal where property would be severely damaged in case of the breaking of lock gates, the giving away of embankments, or other injury to structures, except for the presence of these guard-gates. By closing the gates a short section of canal may be cut off, thus lessening damages and allowing repairs to be made.



GUARD-LOCK JUST EAST OF GENESEE RIVER CROSSING

This lock protects the canal in time of high water in the river. The Lehigh Valley and the Erie railroad bridges are immediately beyond.

The Lehigh and the Erie Railroad Bridges
View west from the guard-lock east of the Genesee river crossing.

This contract has been completed and the total payment, including extra work orders, was $56,521.09.

After stopping on May 18, 1918, work was resumed on July 18. Defective concrete was removed and replaced, the berme back of the wall was graded and fenders and pipe railing placed on the dockwall. The approach to Geneva street was completed in October. A wooden warehouse, 32 ft. by 50 ft., was added to the contract and completed in December. The terminal as completed has a dockwall 360 feet long with wing walls at each end 40 feet long.

Terminal Contract No. 106

This contract is for furnishing fourteen two-ton steam tractor cranes for Barge canal terminals. One of these is for use at Lyons. The contract was awarded to the John F. Byers Machine Co., being signed on February 14, 1918. The engineer's preliminary estimate was $5,250.00 per crane, the contractor's bid, $5,265.00 per crane. The contract price as modified by alteration No. 1 is $5,515.00 per crane. The value of the work done at Lyons during the year is $5,515.00. The work was accepted September 24, 1918, and the final account, amounting to $5,515.00 for the work at Lyons, was approved by the Canal Board October 9, 1918.

The crane for the Lyons terminal was delivered in July, 1918.

ERIE CANAL, RESIDENCY NO. 9

Senior Assistant Engineer A. E. Steere reports:

The construction work on Residency No. 9 under my supervision comprises contracts Nos. 21-A, 23-A, 63-A, 161, 170, 179, 183, 190, 200 and 201, and part of No. 172. The first three mentioned, having been awarded prior to the war, were carried on during the year under chapter 585, Laws of 1918, which provided for completing the work at actual cost from April 7, 1917, until canceled by resolution of the Canal Board. The remaining contracts mentioned above were under construction by the contractors' forces.

Contract No. 200 includes construction at various points

between Rochester and Lockport. A portion of this work is located within the limits of Residency No. 10, but as it was handled without reference to residency divisions, report for the full contract is made under Residency No. 9.

Plans and estimates were prepared in this office for completing the unfinished work on contracts Nos. 23-A and 63-A. The new contract numbers are 190 for 23-A, and 201 and 189 for completing 63-A and a part of old contract No. 49.

Surveys were made from the junction lock at South Greece to Long Pond on Lake Ontario, in order that a study could be made of a method for handling surplus waters from the spillway, when the old canal through the city of Rochester is abandoned.

In addition to the supervision of construction, numerous reports and investigations of a hydraulic nature were prepared for the defence of the State before the State Court of Claims.

Contract No. 63-A

This contract is for completing the construction of the canal from the west line of Wayne county to the east end of contract No. 23-A at King's Bend. Length, 12.22 miles. It was awarded to the State Highway Construction Co., being signed on February 23, 1916. Construction work began on April 6, 1916. The engineer's preliminary estimate was $567,745.70, the contractor's bid, $488,103.20. The contract price as modified by alterations Nos. 1, 2, and 3 is $581,861.30. Excess embankment to the value of $16,000.00 has been authorized by the Canal Board.

D. E. Bellows, Assistant Engineer, was in charge.

This contract was canceled by resolution of the Canal Board on March 6, 1918, and thereafter up to a certain point the work was carried on by the forces of the Superintendent of Public Works. Then the remainder was included in extra work orders under contracts Nos. 179 and 201.

The actual cost of the work from April 7, 1917, to March 6, 1918 (settlement made under chapter 585, Laws of 1918), was $152,142.28, and payment of balance due on this amount was authorized by the Canal Board on August 6, 1919. The final account for work done prior to April 7, 1917, amounting to $235,-634.96, was approved by the Canal Board on May 7, 1919.

The value of work done by the Superintendent of Public Works during the year amounted to $337,843,00, total to date, $672,868.62.

During the navigation season of 1918 dredging operations were carried on by hydraulic and dipper-dredges and by a derrick-boat equipped with a clam-shell bucket. The hydraulic dredge *Ontario II* started excavation during the week of June 14 near the Auburn railroad crossing and continued work at that location until July 27, when operations were discontinued on account of hard material. The dredge was then moved to Sta. 2000, near Bushnell's basin, and resumed operations, working there until the middle of September, cleaning a section of channel about one-quarter mile in length. From this location the dredge was moved to a point immediately east of Knapp's bridge and resumed operations, working in an easterly direction, covering a distance of 4,900 feet. On October 22 this plant was dismantled and shipped from the site.

The dipper-dredge *St. Johnsville,* the derrick-boat *Powhattan* and scows were brought onto the work during June, 1918, and assembled. Dredging operations started about July 14. The *St. Johnsville* widened the prism on the east bank south of Fairport widewaters between Stas. 1985 and 1968. It moved then to the north of the widewaters and resumed prism dredging in conjunction with the *Powhattan.* The bridge at Church street, Fairport, was reached on December 16, when operations stopped and the plant was taken to winter quarters. The prism between the limits mentioned above was left in an incomplete state.

Wash-wall stone was loaded into canal boats at Lyell avenue, Rochester, by means of a steam-shovel and car equipment and transported by canal boats to the site of the contract, where the material was deposited in storage piles and also at points along the canal bank, later to be rehandled and placed in wash-wall notch.

The approaches to Knapp's bridge and the south approach of the Cartersville bridge were completed and covered with gravel surfacing.

Contract No. 201

This contract is for completing prism lining at Cartersville and constructing a stream entrance near Knapp's bridge. It was

awarded to I. M. Ludington's Sons, Inc., being signed on March 13, 1919. The engineer's preliminary estimate was $48,455.25, the contractor's bid, $42,824.75. The contract price as modified by alteration No. 1 is $54,824.75. The value of work done during the year is $46,460.00, total done to date, the same.

D. E. Bellows, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board April 2, 1919, provides for removing material above grade in the canal prism between Stas. 1906 and 2000, also coffer-dams at Stas. 1884 and 1901. It increases the contract price by $12,000.00.

Construction operations were started on February 26, 1919, when several articles of plant were delivered on the site and erection of buildings commenced. Coffer-dams were built to inclose the site at Cartersville, which was unwatered by means of syphons discharging into the manhole at the foot of the north canal bank. The area near Fairport was unwatered by the same means.

During the week of March 25 a Marion revolving steam-shovel with train equipment started excavation in the bottom at the Cartersville end, while slip scrapers were used on the slope. By this means the excavation was carried on almost continuously until the opening of navigation on May 15.

The excavation in the prism west of Fairport was performed by teams and scrapers, which worked continuously, as weather permitted, until the opening of navigation.

The placing of second-class concrete was started at the stream entrance near Knapp's bridge and on the slope at Cartersville during the week of April 5, the stream entrance being completed during April, while the slope lining at Cartersville was continued until the opening of navigation, at which time about 80 per cent of the concrete had been placed. Also the concrete protection in the bottom of the prism joining the guard-gate was completed.

Work on this contract was discontinued upon the opening of navigation, to be resumed at a later date.

Contract No. 179

This contract is for completing the canal prism at the New York Central and the West Shore railroad crossings near Pittsford. It was awarded to I. M. Ludington's Sons, Inc., being signed

on November 9, 1917. The engineer's preliminary estimate was $76,033.50, the contractor's bid, $79,712.20. The contract price as modified by alterations Nos. 1 and 2 is $92,992.20. The value of work done during the year is $27,030.00, total done to date, $89,220.00. The amount paid on extra work orders during the year is $992.00, total to date, the same.

D. E. Bellows, Assistant Engineer, is in charge.

Alteration No. 2, approved by the Canal Board March 19, 1919, provides for removing material above grade in the canal prism east of Sta. 2170. It increases the contract price by $8,000.00.

Work on this contract, suspended during the navigation season of 1918, was resumed during the week ended January 10, 1919, at which time excavation started at the Auburn railroad crossing by a small force loading material into Koppel cars and depositing it along the north canal bank east of guard-gate. Work at the West Shore crossing was resumed during the week of March 7 by a Marion shovel and car equipment, being carried on continuously until the opening of navigation. The concrete sill east of the guard-gate at Cartersville was completed on April 5.

The excavation work under the original contract is completed, but the excavation carried on under alteration No. 2 was confined to clearing the channel between the Auburn crossing and Mitchell's bridge. This section was completed as to depth, with a minimum width of 60 feet near Mitchell bridge. In order to complete the channel to full dimensions it will be necessary to remove about 4,000 cubic yards of material.

Contract No. 23-A

This contract is for completing the construction of the canal from King's Bend to the Lehigh Valley railroad crossing about one-half mile east of the Genesee river. Length, 5.13 miles. It was awarded to H. S. Kerbaugh, Inc., being signed on May 20, 1916. On July 3, 1917, it was assigned to the Empire Engineering Co., Inc., and this assignment was approved by the Superintendent of Public Works August 14, 1917. Construction work began July 8, 1916. The engineer's preliminary estimate was $651,703.10, the contractor's bid, $630,568.42. The contract price as modified by alterations Nos. 1 and 2 is $745,672.42.

C. L. Baldwin, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective December 4, 1918, upon approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to December 4, 1918, was $873,417.57, and payment of balance due on this amount was authorized by the Canal Board on May 7, 1919. The final account for work done prior to April 7, 1917, amounting to $106,502.42, was approved by the Canal Board on May 7, 1919.

This contract has been completed and the total payment, including extra work orders, was $984,058.21.

The final account, amounting to $496.49, on extra work order dated September 29, 1917, was approved by the Canal Board December 4, 1917.

The final account, amounting to $496.49, on extra work order dated December 31, 1917, was approved by the Canal Board December 4, 1918.

The work performed on this contract during the fiscal year, which was carried on under chapter 585, Laws of 1918, was done mainly by floating plant. The dipper-dredges *Peconic* and *Pontiac* excavated in the canal prism from a point east of Clinton avenue to the guard-lock, the material being either loaded into steel bottom-dump scows of about 600 cubic yards capacity and spoiled in deep water west of lock No. 33 or placed along the canal banks, where it was later rehandled and used in raising them.

The derrick-boat *Giant* reëxcavated material previously deposited by scows along the bottom angle and cast it into spoil-areas on the north and south banks, these areas having been formed prior to the opening of navigation by dikes thrown up by steam shovels and made for the purpose of raising low banks. This derrick-boat excavated from scow dump-ground and spoiled material on the north bank between lock No. 33 and South avenue bridge, and completed embankment back of the north wall at the guard-lock in the same manner.

Derrick-scows Nos. 208 and 275 excavated a ridge west of Clinton avenue, cleaned the prism under the highway bridges,

trimmed material from prism slope that was beyond the reach of the dipper-dredges and placed embankment back of the south abutment of the guard-lock.

The intercepting drainage system and the stream entrance on the north bank were completed from the west Henrietta road to the guard-lock, where the water was taken into the canal. The canal banks at locks Nos. 32 and 33 were graded and trimmed and excavation for snubbing-posts made at locations required.

Concrete work, consisting of slope paving under the east and west Henrietta road bridges, snubbing-posts at locks Nos. 32 and 33 and counterweights for the east gates at the guard-lock, was completed.

The east gate, towers and bridge of the guard-lock were assembled, riveted and partly painted.

Plans were prepared in this office for the purpose of completing the remaining work by a new contract (let as contract No. 190).

Contract No. 190

This contract is for completing the canal from King's Bend to the Lehigh Valley railroad crossing at Rochester. It was awarded to the Empire Engineering Co., Inc., being signed on March 20, 1919. Construction work began March 17, 1919. The engineer's preliminary estimate was $284,752.50, the contractor's bid, $245,191.00. The contract price as modified by alteration No. 1 is $249,679.00. Excess 12-inch vitrified pipe, laid, to the value of $180.00 has been authorized by the Canal Board. The value of work done during the year is $65,230.00, total done to date, the same.

C. L. Baldwin, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board May 7, 1919, provides for the removal of material lying above grade in the bottom of the canal between approximately Stas. 2251 and 2300. It increases the contract price by $4,488.00.

Work on this contract consisted of the completion of the wing-walls for the east and west Henrietta road bridges, completion of concrete spillways for stream entrances, and excavation for wash-wall notch and placing of wash wall.

The sill of the west gate of the guard-lock was repaired. Track

rails for the east gate were adjusted and concreted into place. Also block in south lock wall was repaired.

A floating plant, consisting of the dipper-dredge *Pontiac* and derrick-boats *Giant* and *Powhattan* with tugs and canal barges, was assembled upon the opening of navigation. It is trimming slopes and cleaning the canal prism where necessary in preparation for the placing of wash wall.

Wash wall is shipped to the site of the contract by canal boats and deposited roughly into the wash-wall notch, later to be worked into final position when the water is drawn from the canal.

The intercepting ditch west from the west Henrietta road has been completed and several other ditches have been cleaned to final grades. The vitrified tile drain north along Clinton avenue was completed excepting the head-walls.

Contract No. 183

This contract is for aligning the bridge which crosses the Barge canal at the west Henrietta road, Rochester. It was awarded to the Donnell-Zane Co., being signed on September 11, 1918. The engineer's preliminary estimate was $6,850.00, the contractor's bid, $5,915.25. The value of work done during the year is $5,504.53, total done to date, the same. The work was accepted June 11, 1919, and the final account, amounting to $5,504.53, was approved by the Canal Board September 17, 1919.

C. L. Baldwin, Assistant Engineer, is in charge.

The contractor performed a small amount of work on the north and south abutments during the months of November and December, then closed down until March 24, 1919, when operations were resumed. The abutments and skew backs were completed during the month of April, and preparations made for swinging the bridge to its new alignment, which was completed on May 3, 1919, and opened for traffic.

Contract No. 161

This contract is for furnishing and delivering electric motors and certain machinery at Rochester. It was awarded to Lord Construction Co., being signed on August 3, 1917. The engineer's preliminary estimate was $5,972.00, the contractor's bid,

$6,452.00. The contract price as modified by alteration No. 1 is $15,867.35. Excess quantities to the value of $39.24 have been authorized by the Canal Board. The work was accepted April 2, 1919, and the final account, amounting to $15,750.20, was approved by the Canal Board August 20, 1919. The amount paid on extra work orders during the year is $455.02, total to date, $937.02.

Gordon Edson, Assistant Engineer, was in charge at the west lock and C. L. Baldwin, Assistant Engineer, at the east lock.

An extra work order dated June 18, 1918, provides for installing and also removing, when so directed, temporary machinery, electric wiring, etc., at the guard-locks. The final account, amounting to $455.02, was approved by the Canal Board February 13, 1919.

Work done during the fiscal year consisted of installing operating equipment for the east gate of the east lock and completing permanent wiring. Construction work was completed during the week ended January 24, 1919.

Contract No. 172

This contract is for furnishing and delivering barrel buoys and lamp-posts for aids to navigation on the Seneca, Clyde, Genesee and Tonawanda rivers. It was awarded to Lupfer & Remick, being signed on March 15, 1918. The engineer's preliminary estimate was $14,853.00, the contractor's bid, $13,063.20. The contract price as modified by alteration No. 1 is $12,921.45. The work was accepted September 24, 1918, and the final account, amounting to $12,913.35, was approved by the Canal Board September 24, 1918. The amount paid on extra work orders to date is $906.50, of which amount $49.00 applies to work on this residency.

J. S. Summers, Assistant Engineer, was in charge.

The portion of the contract affecting this residency provided for furnishing and delivering at Rochester 10 barrel buoys and 4 lamp-posts for use on the Genesee river. The buoys were delivered as originally planned, but the lamp-posts were sent to Tonawanda.

The final estimate for work done on this residency amounted to $651.90. Construction work was completed the previous year.

Contract No. 21-A

This contract is for completing the canal from about Sta. 2249, about 400 feet west of Genesee river, to about Sta. 2566 + 58, about 442 feet from the east end of contract No. 6. Length, 2.23 miles. It was awarded to Walsh Construction Co., being signed on February 16, 1916. Construction work began March 1, 1916. The engineer's preliminary estimate was $415,700.00, the contractor's bid, $384,928.69. The contract price as modified by alterations Nos. 1 and 2 is $428,475.54. Excess concrete to the value of $9,000.00 has been authorized by the Canal Board.

Gordon Edson, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 17, 1918. The cancelation became effective December 4, 1918, upon approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to December 4, 1918, was $415,266.46, and payment of balance due on this amount was authorized by the Canal Board on May 21, 1919. The final account for work done prior to April 7, 1917, amounting to $205,061.14, was approved by the Canal Board on May 7, 1919.

This contract has been completed and the total payment, including extra work orders, was $631,400.85.

The final account, amounting to $8,919.58, on extra work order dated January 2, 1918, was approved by the Canal Board August 31, 1918.

The final account, amounting to $780.00, on extra work order dated January 2, 1918, was approved by the Canal Board August 14, 1918.

The removal of the rock-fill approach used for construction trains on the north side of the prism near Sta. 2522 was carried on until July 12 by means of a locomotive crane equipped with an orange-peel bucket. This crane was later supplanted by a floating plant and scows, which were used in excavating the fill under the construction tracks in the bottom of the prism. Some blasting was required to loosen the compacted material east of the B. R. & P. railroad crossing. This plant was operated from October 18 to

November 21, when operations ceased and the plant was dismantled and shipped away. Grading of the roadway at the guard-lock was completed and gravel surfacing placed thereon. Grading slopes between the guard-lock and Scottsville road was completed. The lock-tender's shelter at the guard-lock was completed July 12. All the plant was shipped away and the site cleaned up.

Contract No. 170

This contract is for constructing a junction lock and completing the canal prism excavation and incidental work at South Greece. It was awarded to Cleveland & Sons Company, being signed on November 10, 1917. The engineer's preliminary estimate was $54,800.50, the contractor's bid, $64,588.50. The contract price as modified by alteration No. 1 is $64,942.50. The value of work done during the year is $12,384.24. The work was accepted December 18, 1918, and the final account, amounting to $56,444.24, was approved by the Canal Board April 16, 1919. The amount paid on extra work orders during the year is $3,651.51, total to date, the same.

A. S. Milinowski, Assistant Engineer, was in charge.

The final account, amounting to $3,651.51, on extra work order dated June 4, 1918, was approved by the Canal Board December 27, 1918. This order provided for constructing timber platforms to facilitate the operation of balance beams, for constructing a bridge across the lower end of the lock, for excavating pits to close up blind drains and for constructing drainage ditches.

The work on this contract remaining to be done at the beginning of the fiscal year comprised excavation and protection work for the weir outlet channel and the completion of a short stretch of canal prism westerly from the lock and spillway. The outlet channel was excavated by a traveling derrick equipped with a Page bucket. The canal prism excavation was completed by a floating plant equipped with an orange-peel bucket, the material being loaded upon flat scows, rehandled and deposited as spoil along the canal bank. Several farm drainage systems were built to relieve seepage conditions caused by canal construction at this location. The contract was completed and the site cleared up by the 15th of December, 1918.

Contract No. 200

This contract is for driving steel sheet-piling, placing concrete ling, etc., between Rochester and Lockport. It was awarded to Lupfer & Remick, being signed on February 26, 1919. Construction work began the first week of March, 1919. The engineer's preliminary estimate was $257,992.50, the contractor's bid, $180,248.50. Excess quantities to the value of $798.00 have been authorized by the Canal Board. The value of work done during the year is $112,540.00, total done to date, the same. The amount paid on extra work orders during the year is $9,269.00, total to date, the same.

A. S. Milinowski, Assistant Engineer, is in charge.

An extra work order dated March 14, 1919, provides for transporting steel sheet-piling owned by the State from various localities where it was stored to the points where it is to be driven on contract No. 200, and for cutting off battered ends and cutting to proper lengths and driving this sheet-piling, at special unit prices. Partial payment, amounting to $9,269.00, was approved by the Canal Board April 2, 1919.

Material and plant were shipped to the various points and construction work started during the first week of March. One piledriver outfit was assembled at Maybee's and three drivers at South Greece and Cromwell's bridge. The pile-driving at Maybee's bridge was completed on March 21. This driver was moved to Holley, where the pile-driving was completed on April 18. This driver was then dismantled and sent to Albion, to complete the pile-driving at that point. Two pile-driving plants at South Greece and Cromwell's bridge were operated almost continuously until the work was completed May 9, when the plants were dismantled.

Excavation at Fancher for trimming the slope was started early in March and carried to completion by the end of the month. Forms were placed on the slope and materials for concrete delivered. Concrete work at this location was started during the week of April 4 and completed on April 18.

The work at Holley comprised excavation and wash wall at the guard-gate, placing of embankment at Tuttle's bridge and raising

concrete spillway, all of which were carried out in detail and completed on May 13.

At Medina, culvert No. 96, work consisted of excavation, chipping of concrete from old culvert barrel, driving steel sheet-piles for cut-off at the ends of the protection and placing of concrete and waterproofing over the designated area, all of which were carried out in detail and completed on May 13, at which time water was turned in for the opening of navigation. The plant was removed and the site cleaned up.

Senior Assistant Engineer A. R. Morse reports:

The part of Residency No. 9 under my supervision is in the city of Rochester and embraces all of the work under construction that is connected with the development of the Rochester harbor and Rochester terminal of the Barge canal. It also embraces other work that is proposed or under construction incidental to the Barge canal crossing of the Genesee river in Genesee Valley park. The construction work is divided into the following contracts: Contracts Nos. 59, 138, 144, 191 and 192, and terminal contracts Nos. 48, 57 and 70. There are several other pieces of construction work in the residency intimately connected with the Barge canal, such as the Clarissa street bridge over the Genesee river, the Erie Railroad crossing of the Genesee river south of Clarissa street, the Erie Railroad and the Lehigh Valley Railroad crossings of the Barge canal in Genesee Valley park, and the Pennsylvania Railroad (main line) crossing of the Barge canal west of the Genesee river.

Considerable extra work devolved upon the engineering force of the residency, because of the cancelation and subsequent agreements for contracts Nos. 138 and 59. The work, however, under the agreement plan has progressed well toward completion.

Contract No. 59

This contract is for the construction of the canal from the west end of contract No. 23-A to the east end of contract No. 21-A, and the construction of Rochester harbor, between the crossing at

Genesee Valley park and a point about 400 feet south of the proposed dam near Court street bridge. Length along the canal, 0.63 mile, along the harbor, 3.25 miles. It was awarded to MacArthur Brothers Company, being signed on November 3, 1916. Construction work began January 3, 1917. The engineer's preliminary estimate was $1,675,252.86, the contractor's bid, $1,596,788.91. The contract price as modified by alterations Nos. 1 and 2 is $1,603,285.11. The amount paid on extra work orders during the year is $2,030.85, total to date, $68,054.31.

Arthur S. Whitbeck, Assistant Engineer, is in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective August 14, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 14, 1918, was $657,165.59, and payment of balance due on this amount was authorized by the Canal Board on May 7, 1919. The final account for work done prior to April 7, 1917, amounting to $20,475.95, was approved by the Canal Board on May 7, 1919.

The contractor is completing the work. The total payments to date, including extra work orders, are $1,563,026.00.

An extra work order dated September 24, 1917, provides for constructing a timber movable dam across the Genesee river at Elmwood avenue. The final account, amounting to $67,254.31, was approved by Canal Board November 13, 1918.

The uncompleted portion of the contract in Genesee Valley park east of the Genesee river was relet as a new contract (No. 192).

The season having been exceedingly open, a large amount of work has been done during the year both in the excavation of the river channel and in building river walls, leaving a very small percentage to be done. Thirty-nine hundred linear feet, or 63 per cent, of the river walls have been constructed.

During the month of May, 1919, the water in the Genesee river assumed flood conditions and brought down quantities of drift wood and trees, which lodged at the temporary dam in the Genesee river. It was impossible at the time to remove some of the debris

and consequently a large section of the dam was carried away. The dam was quickly repaired, however, by placing timber cribs in the breach, upon which the damaged portion was reconstructed.

Contract No. 192

This contract is for completing the canal from the east guard-lock to the Genesee river, and the work in Genesee Valley park. Length, 0.506 mile. It was awarded to Brown & Lowe Co., being signed on January 22, 1919. Construction work began February 1, 1919. The engineer's preliminary estimate was $327,525.00, the contractor's bid, $428,860.00. The value of work done during the year is $133,840.00, total done to date, the same.

Considerable progress was made in prism excavation, although the site was flooded several times by the waters of the Genesee river.

The north abutment of the west foot-bridge is complete and some work has been done on the south abutment. The spillway at the entrance of Red creek into the Barge canal channel is done. The north abutment of the east foot-bridge is completed and work on the south abutment has been started. The entire north retaining wall and the portion of the south wall between the Lehigh Valley R. R. bridge and the guard-lock has been completed.

Some progress has been made in filling the temporary channel of Red creek and in building road in Plymouth avenue and the approaches to Elmwood avenue bridge.

Contract No. 191

This contract is for excavating the canal channel in the Genesee river near Elmwood avenue bridge. Length, 0.62 mile. It was awarded to the Empire Engineering Co., Inc., being signed on January 14, 1919. Construction work began June 7, 1919. The engineer's preliminary estimate was $189,850.00, the contractor's bid, $176,170.00. The value of work done during the year is $7,360.00, total done to date, the same.

The contractors are excavating the rock and other material in the river channel by means of dredge, drill-boat, derrick-boat and scows.

Contract No. 144

This contract is for constructing two concrete bridges over Red creek in Genesee Valley park, Rochester. It was awarded to W. F. Martens & Co., Inc., being signed on June 14, 1917. Construction work began June 18, 1917. The engineer's preliminary estimate was $41,480.70, the contractor's bid, $41,258.70. The contract price as modified by alteration No. 1 is $46.208.70. The value of work done during the year is $840.00, total done to date, $6,580.00.

Alteration No. 1, approved by the Canal Board September 10, 1918, provides for the use of sheeting and bracing in the construction of the abutments of the lower bridge. It increases the contract price by $4,950.00.

With the exception of a small amount done during July, 1918, practically no work was done on the contract during the year.

On May 7, 1919, the Canal Board canceled the contract and directed the State Engineer to prepare plans and specifications for a new contract. These plans have been prepared and the new contract is known as No. 144-A.

Contract No. 138

This contract is for constructing a movable dam, bulkheads, retaining walls and incidental work, at Rochester. It was awarded to the Combined Construction Company, being signed on April 19, 1917. Construction work began on June 8, 1917. The engineer's preliminary estimate was $302,700.30, the contractor's bid, $321,115.12.

J. S. Summers, Assistant Engineer, is in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective August 14, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 14, 1918, was $72,908.94, and payment of balance due on this amount was authorized by the Canal Board on February 13, 1919.

The contractor is completing this work and the total payments to date, including extra work orders, are $471,893.00.

ROCHESTER HARBOR

View north from Clarissa street bridge. The terminal is seen in the distan ce at the right.

ROCHESTER HARBOR
View north from the east wall, showing the movable dam (bridge and sector gate types) at the far end.

PLYMOUTH AVENUE APPROACH TO GENESEE VALLEY PARK, ROCHESTER
Progress in work of raising grade, building wall and improving road; also excavating river channel for Rochester harbor.

VIADUCT TO ROCHESTER TERMINAL

Approach to the canal terminal from Court street. As Court street is near to the business center of Rochester, probably the bulk of canal traffic will pass over this viaduct.

BASCULE BRIDGE AT MAIN AND WEBSTER STREETS, TONAWANDA AND NORTH TONAWANDA
View looking north and showing coffer-dam.

South Abutment of Bascule Bridge, Tonawanda and North Tonawanda

In the rearrangement of railroad crossings one bridge has been eliminated and this bridge carries two roads.

BARGE CANAL TERMINAL, ERIE BASIN, BUFFALO

Construction of warehouse. The freight section, 80 by 500 feet, has a steel framework; the two-story office section, 80 by 40 feet, has a reinforced concrete frame.

BARGE CANAL TERMINAL, OHIO BASIN, BUFFALO
New Ohio street bridge across inlet from Buffalo river to Ohio basin.

During the year the west wall and head-gates were completed as well as the east and west abutments of the bridge dam. The central pier and operator's pier were completed with the exception of the tile roofing of the operator's cabin. The sill of the bridge dam was placed early in the year, as well as the drain from the sector gate pits. The concrete for the sector gate pits is nearing completion. Excavation for the east wall is progressing and the foundation for the first section of the east head-gates is in place. Some of the steel for the sector gates was placed in position, and also two sections of the lower chord of the bridge dam were placed. The whole work originally planned is progressing well toward completion.

Terminal Contract No. 48 — Rochester

This contract is for constructing a terminal on the east side of the Genesee river at Rochester. It was awarded to Michael H. Ripton, being signed on October 19, 1916. Construction work began November 22, 1916. The engineer's preliminary estimate was $101,000.00, the contractor's bid $93,828.00. The contract has been modified by alteration No. 1, which made no change in the contract price.

C. E. Elmendorf, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective August 14, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 14 1918, was $89,416.44, and payment of balance due on this amount was authorized by the Canal Board on March 19, 1919. The final account for work done prior to April 7, 1917, amounting to $5,350.00, was approved by the Canal Board on January 29, 1919.

This contract has been completed and the total payment including extra work orders was $94,766.00. The contract was practically completed when it was canceled.

There have been numerous track shifts by the Lehigh Valley Railroad Company, so as to accomodate construction work for the

terminal. The railroad company also filled the old Genesee river feeder, east of the site of the contract, and occupied this area with their tracks.

Terminal Contract No. 57 — Rochester

This contract is for constructing parts of an approach from Court street and South avenue to the terminal at Rochester. It was awarded to Charles Kiehm, being signed on February 25, 1919. Construction work began March 4, 1919. The engineer's preliminary estimate was $133,003.35, the contractor's bid, $120,597.61. The value of work done during the year is $44,820.00, total done to date, the same.

The viaduct has been completed to base of balustrade between Stas. 0 + 90.5 and 2 + 79.5. All of the columns have been placed in the canal section and on the tow-path east of the Lehigh Valley railroad tracks. Also some progress has been made on the walls and abutments specified in the contract. By the time of opening the old Erie canal through Rochester the foundations in the prism had all been completed and the work carried forward so as to cause no interference with navigation through the season.

Terminal Contract No. 70 — Rochester

This contract is for razing buildings and clearing State lands at Rochester. It was awarded to George W. Chambers, being signed on April 9, 1919. The work of demolishing buildings began on April 3, 1919. The engineer's preliminary estimate was $1,600.00 to be paid to the State of New York for all the materials that could be salvaged from the buildings and other structures on the site of the contract; the contractor's bid was $4,267.00 to be paid to the State.

There were about 43 buildings to be razed on the site of the contract and numerous fences, trees and various structures to be removed. Nearly all of these buildings have been removed above the foundation walls and some clearing of trees, fences and bushes has been done.

ERIE CANAL, RESIDENCY No. 10

Senior Assistant Engineer B. E. Failing reports:

This residency extends from the east line of Orleans county westward to the Sulphur Springs guard-lock, a distance of 43.75 miles.

All of the contracts in this residency with the exception of contracts Nos. 98 and 200, and terminal contracts Nos. 101 and 106, have been reported on as finished in the reports of previous years. A report on contract No. 98 is submitted herewith. Contract No. 200 includes construction at various points between Rochester and Lockport, extending through Residencies Nos. 9 and 10. A detailed description of the whole work will be found in report by Senior Assistant Engineer A. E. Steere for Residency No. 9. Portions of terminal contracts Nos. 101 and 106 are in both Residencies Nos 10 and 11. Final estimates on these contracts have been prepared and approved. The reports, however, are given under Residency No. 11.

Contract No. 98

This contract is for constructing a lift-bridge at Adams street and removing the existing lift-bridge at Chapel street, Lockport. It was awarded to the Tifft Construction Co., Inc., being signed on November 24, 1916. The engineer's preliminary estimate was $77,496.60, the contractor's bid, $82,276.25. The contract price as modified by alteration No. 1 is $82,426.25.

H. N. Metzger, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective August 31, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to August 31, 1918, was $76,461.81, and payment of balance due on this amount was authorized by the Canal Board on February 19, 1919. The final account for work done prior to April 7, 1917, amounting to $6,919.17, was approved by the Canal Board on January 29, 1919.

This contract has been completed and the total payment, including extra work orders, was $84,723.36.

An extra work order dated April 29, 1918, provides for embankment in front of the State yards at Lockport. The final account, amounting to $842.38, was approved by the Canal Board October 9, 1918.

The work done this year consisted in finishing the approaches, building the wooden fence and placing pipe railing on the pit covers. All the other work was completed in previous years.

ERIE CANAL, RESIDENCY No. 11

Senior Assistant Engineer B. E. Failing reports:

Residency No. 11 extends from the Sulphur Springs guard-lock to and through the city of Buffalo. Contracts Nos. 19-A, 83 and 147, and part of No. 172, and terminal contracts Nos. 21, 21-P, 53, 61, 62, 66, 67, 68, 69, 107, 212 and 216 and parts of Nos. 101, 106 and 113 have all been active on this residency during the past year. Reports on these contracts follow. Also studies have been made for the track connections at the lower-town terminal, Lockport.

Contract No. 19-A

This contract is for dredging, etc., on contract No. 19, from the guard-lock at Sulphur Springs to Tonawanda. It was awarded to H. S. Kerbaugh, Inc., being signed on November 3, 1916. On July 3, 1917, it was assigned to the Empire Engineering Co., Inc., and this assignment was approved by the Superintendent of Public Works August 14, 1917. Construction work began in May, 1917. The engineer's preliminary estimate was $152,200.00, the contractor's bid, $169,750.10.

R. W. Cady, Assistant Engineer, was in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 9, 1918. The cancelation became effective October 9, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the terms of the law. The actual cost of the work from April 7, 1917, to October 9, 1918, was $236,943.42, and payment of balance due on this amount was authorized by the Canal Board on May 7, 1919. No work was done prior to April 7, 1917.

This contract has been completed and the total payment, including extra work orders, was $240,923.81.

Work was completed on September 6, 1918. Due to the fact that the side slopes along Tonawanda creek were unstable, slides of considerable magnitude occurred along the contract. Some of them amounted to fifty thousand yards and completely blocked the channel, thereby delaying the completion of the work. The work this year has consisted in removing the slides, cleaning up the channel, building dykes for hydraulic spoil, repairing roads which were damaged by the slides and finishing the new road at Pendleton.

Contract No. 83

This contract is for completing the canal at Tonawanda and removing a guard-lock and coffer-dam near Sulphur Springs. It was awarded to the Mohawk Dredge & Dock Co., being signed on October 22, 1917. The engineer's preliminary estimate was $149,604.50, the contractor's bid, $216,915.00. The contract price as modified by alterations Nos. 1 and 2 is $195,351.00. The value of work done during the year is $103,266.00. The work was accepted June 25, 1919, and the final account, amounting to $158,466.60, was approved by the Canal Board July 16, 1919. The amount paid on extra work orders during the year is $3,023.75, total to date $5,723.75.

R. W. Cady, Assistant Engineer, was in charge.

Alteration No. 2, approved by the Canal Board December 10, 1918, provides for eliminating the retaining wall on the south side of the canal easterly from the south pier of Main and Webster street bridge. It decreases the contract price by $21,264.00.

An extra work order dated July 17, 1918, provides for making fill east of the old dam and placing stone protection thereon and for pulling old piles and removing old head-gate from the channel at Tonawanda. The final account, amounting to $2,000.00, was approved by the Canal Board December 18, 1918.

An extra work order dated October 24, 1918, provides for repairing the highway east of New Home bridge. The final account, amounting to $1,023.75, was approved by the Canal Board December 4, 1918.

The work this year has consisted in completing the 12-foot channel at Tonawanda, and finishing the removal of the old guard-lock at Pendleton. The work of excavating was done by three derrick-boats, operating clam-shell buckets, and one dipper-dredge. The material was spoiled in the Government dumping grounds in Niagara river and in the back channels of Tonawanda creek. Contract work was completed on April 10, 1919.

Contract No. 147

This contract is for constructing the substructure, superstructure and approaches of a bascule bridge across Tonawanda creek at Main and Webster streets, Tonawanda and North Tonawanda. It was awarded to Scherzer Rolling Lift Bridge Co., being signed on September 10, 1917. On June 5, 1918, it was assigned to Lathrop, Shea & Henwood Co., and this assignment was approved by the Superintendent of Public Works July 1, 1918. Construction work began in October, 1917. The engineer's preliminary estimate was $227,032.80, the contractor's bid, $233,986.30. The contract price as modified by alteration No. 1 is $234,260.40. The value of work done during the year is $47,640, total done to date $78,170. The amount paid on extra work orders during the year is $2,213.56, total to date $5,858.06.

R. W. Cady, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board February 19, 1919, provides for constructing a retaining wall at the southeast corner of south abutment, and for modifying the foundation of the retaining wall at the southwest corner. It increases the contract price by $274.10.

An extra work order dated July 17, 1918, provides for driving fender piles at the temporary bridge and maintaining a sidewalk at the bank building. The final account, amounting to $1,337.33, was approved by the Canal Board October 16, 1918.

An extra work order dated February 5, 1919, provides for furnishing and driving foundation piles for retaining walls, south abutment.

An extra work order dated April 7, 1919, also provides for driving fender piles at the temporary bridge and maintaining a sidewalk at the bank building.

During the year the north abutment has been finished and the coffer-dam removed; a coffer-dam has been constructed and the south abutment built; also a steel sheet-piling coffer-dam has been constructed for the center pier and the work is nearly ready for concreting. Two cars of steel for the superstructure have been received and unloaded.

Contract No. 172

This contract is for furnishing and delivering barrel buoys and lamp-posts for aids to navigation on the Seneca, Clyde, Genesee and Tonawanda rivers. It was awarded to Lufper & Remick, being signed on March 15, 1918. The engineer's preliminary estimate was $14,853.00, the contractor's bid, $13,063.20. The contract price as modified by alteration No. 1 is $12,921.45. The work was accepted September 24, 1918, and the final account, amounting to $12,913.35, was approved by the Canal Board Stepember 24, 1918. The amount paid on extra work orders to date is $906.50, of which amount $392.00 applies to work on this residency.

R. W. Cady, Assistant Engineer, was in charge.

The portion of the contract affecting this residency provided for furnishing and delivering 40 red and 40 black barrel buoys and 15 red and 15 black lamp-posts at Tonawanda. These were delivered and also four additional lamp-posts originally planned for delivery at Rochester.

The final estimate of work done on this residency amounted to $5,483.80. Work was completed the previous year.

Terminal Contract No. 101

This contract is for furnishing and installing steel stiff-leg derricks on terminal sites at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda. This report relates to the derricks at Lockport and Tonawanda. The contract was awarded to E. Brown Baker, being signed on December 18, 1916. On February 21, 1917, it was assigned to the Mohawk Dredge & Dock Co., Inc., and this assignment was approved by the Superintendent of Public Works March 26, 1917. The engineer's preliminary estimate was $6,867.30 for these two derricks at Lockport and Tonawanda, the

contractor's bid, $10,169.30. Excess metal to the value of $1,932.00 has been authorized by the Canal Board. The work was accepted December 4, 1918, and the final account, amounting to $11,263.22 for Lockport and Tonawanda, was approved by the Canal Board December 27, 1918.

The final estimate was prepared during this year, contract work having been completed the previous year.

Terminal Contract No. 21 — Erie Basin, Buffalo

This contract is for constructing a terminal at Erie basin, Buffalo. It was awarded to H. S. Kerbaugh, Inc., being signed on January 12, 1914. It was assigned to the Empire Engineering Co., Inc., and this assignment was approved by the Superintendent of Public Works August 10, 1917. Construction work began in April, 1914. The engineer's preliminary estimate was $1,513,-925.00, the contractor's bid, $798,605.80. The contract price as modified by alterations Nos. 1 and 2 is $797,772.30.

Elias H. Anderson, Assistant Engineer, is in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on March 19, 1919. The cancelation became effective April 2, 1919, on approval of the Canal Board, the contractor having filed a stipulation of his compliance with the law. The actual cost of the work from March 1, 1918, to April 2, 1919, was $188,963.08 and payment of balance due on this amount was authorized by the Canal Board on June 11, 1919. The final account for work done prior to March 1, 1918, amounting to $645,534.37 was approved by the Canal Board on June 11, 1919.

The contractor is completing the work and the total payments to date, including extra work orders, are $898,903.56.

An extra work order dated March 29, 1918, provides for constructing a sewer and manhole under the permanent pavement, for placing 100 feet of conduit for electric wires at each pier and for installing a water-main. The final account, amounting to $1,029.11, was approved by the Canal Board August 31, 1918.

This contract was completed a year ago except for excavation in the harbor. The contract provides for excavating, to a depth of 23 feet at mean lake level, the entire area of Erie basin between the New York State breakwater and the shore line, a width of about

900 feet and extending from the 23-foot channel of the U. S. Government Black Rock harbor improvement southerly about 2,200 feet to the 23-foot entrance of the Buffalo river.

Exclusive outside of the winter months January, February and March, a drill-boat has worked three shifts during the year and has finished the drilling and blasting of the rock which lies above the 20-foot depth. It was removed from the contract on June 27, 1919. The earth and rock have been practically removed to a 20-foot depth. It is now the intention to complete this excavation to the 20-foot depth and discontinue work. The quantities of material excavated during the year amounted to about 35,473 cu. yds. of rock and 32,313 cu. yds. of earth.

Also a rock mound was built to protect the south end of the State breakwater.

Terminal Contract No. 21-P — *Erie Basin, Buffalo*

This contract is for paving part of the terminal site at Erie basin, Buffalo. It was awarded to Henry P. Burgard Company, being signed on May 6, 1918. Construction work began in May, 1918. The engineer's preliminary estimate was $14,180.00, the contractor's bid, $14,350.00. The value of work done during the year is $12,696.00. The work was accepted November 13, 1918, and the final account, amounting to $13,066.00, was approved by the Canal Board November 13, 1918.

Elias H. Anderson, Assistant Engineer, was in charge.

All of the work on this contract, with the exception of the grading, was performed during this year. It was completed in October.

Terminal Contract No. 61 — *Erie Basin, Buffalo*

This contract is for constructing railroad track approach to pier No. 1, Erie basin, Buffalo. It was awarded to the Walsh Construction Co., being signed on May 15, 1918. Construction work began in May, 1918. The engineer's preliminary estimate was $9,720.00, the contractor's bid, $11,650.00. The value of work done during the year is $8,960, total done to date, $10,430.

Elias H. Anderson, Assistant Engineer, is in charge.

The work this year has consisted in placing ballast and laying tracks and finishing about 75 per cent of the surface. After

the rails were laid the N. Y. C. railroad refused to connect this siding with its main line. During the latter part of the year, however, a connection was made, enabling the contractor to deliver the ballast for completing his work.

Terminal Contract No. 62 — Erie Basin, Buffalo

This contract is for constructing railroad tracks and crane rails on pier No. 1, Erie basin, Buffalo. It was awarded to the Walsh Construction Co., being signed on May 15, 1918. The engineer's preliminary estimate was $8,470.00, the contractor's bid, $11,-400.00. The value of work done during the year is $9,420, total done to date, the same.

Elias H. Anderson, Assistant Engineer, is in charge.

The work of laying track was commenced in October, 1918, and the contract was completed in June, 1919, with the exception of finishing the surfacing of tracks. Work on this contract was delayed on account of the contractor waiting for a connection to be made with the tracks of the N. Y. C. railroad.

Terminal Contract No. 66 — Erie Basin, Buffalo

This contract is for placing riprap along the shore of Erie basin, between slip No. 2 and Lake street, Buffalo. It was awarded to the Empire Engineering Co., Inc., being signed on June 29, 1918. The engineer's preliminary estimate was $11,850.00, the contractor's bid, $12,820.00. The value of work done during the year is $11,400.00, total done to date, the same.

Elias H. Anderson, Assistant Engineer, is in charge.

The contractor began excavating with a dipper-dredge on September 11, 1918, completing this work in December. Riprap has been placed and the contract finished with the exception of about two scow loads of stone.

Terminal Contract No. 67 — Erie Basin, Buffalo

This contract is for constructing a railroad track approach to pier No. 2, Erie basin, Buffalo. It was awarded to the Walsh Construction Co., being signed on July 3, 1918. Construction work began in September, 1918. The engineer's preliminary

estimate was $7,000.00, the contractor's bid, $7,616.00. The value of work done during the year is $7,160.00, total done to date, the same.

Elias H. Anderson, Assistant Engineer, is in charge.

All the work on the contract has been completed with the exception of the surfacing. The work was delayed on account of the contractor waiting for this track to be connected with the N. Y. C. railroad.

Terminal Contract No. 68 — Erie Basin, Buffalo

This contract is for constructing railroad track on pier No. 2, Erie basin, Buffalo. It was awarded to the Walsh Construction Co., being signed on July 3, 1918. Construction work began in September, 1918. The engineer's preliminary estimate was $6,820.00, the contractor's bid, $7,445.00. The value of work done during the year is $4,630.00, total done to date, the same.

Elias H. Anderson, Assistant Engineer, is in charge.

Work on the contract has been completed with the exception of spreading stone screenings for the surfacing. The work was delayed on account of the contractor waiting for a connection to be made with the N. Y. C. railroad.

Terminal Contract No. 69 — Erie Basin, Buffalo

This contract is for protecting the shore of Erie basin, between Lake street and slip No. 1, Buffalo. It was awarded to Richard C. Bush, being signed on February 27, 1919. Construction work began May 9, 1919. The engineer's preliminary estimate was $6,780.00, the contractor's bid, $5,886.00. The value of work done during the year is $2,140.00, total done to date, the same.

Elias H. Anderson, Assistant Engineer, is in charge.

The old crib which was to be used for the foundation of the new work was found to be in poor condition and additional cribwork was made necessary. All the additional cribwork, together with the timber cribs called for in the orginal contract were completed during the year, and the foundation was made ready for the concrete dockwall.

Terminal Contract No. 107 — *Erie Basin, Buffalo*

This contract is for installing electric wiring, lighting, power and battery-charging equipment for the canal terminal at Erie basin, Buffalo. It was awarded to J. Livingston & Co., Inc., being signed on March 4, 1919. The engineer's preliminary estimate was $35,025.00, the contractor's bid, $28,238.50.

No construction work has yet been done.

Terminal Contract No. 212 — *Erie Basin, Buffalo*

This contract is for constructing a terminal freight-house on pier No. 1, Erie basin, Buffalo. It was awarded to the Felton Construction Corporation, being signed on November 14, 1918. The engineer's preliminary estimate was $175,000.00, the contractor's bid, $182,182.00. The contract price as modified by alteration No. 1 is $181,669.00. The value of work done during the year is $15,510.00, total done to date, the same.

Elias H. Anderson, Assistant Engineer, is in charge.

Alteration No. 1, approved by the Canal Board June 25, 1919, provides for steel trusses and columns, a new type of crane rail girder, cast-iron conductor pipes with copper flashings and connections, and revised inscriptions. It decreases the contract price by $513.00.

An extra work order dated April 4, 1919, provides for installing water-service pipes, sewer pipes and a settling basin.

The freight-house is to be constructed of steel reinforced concrete and brick, and will be 500 feet long by 80 feet wide. It will have track connections on both sides of the pier.

The contractor began excavating on February 24, 1919, with a Keystone excavator and completed the excavation for the foundation in March. Foundation piles were driven and foundation walls completed in June, 1919. One thousand feet of tile drain has been laid, forms have been built for reinforced concrete columns and slab for the head-house, and reinforcing steel is being placed.

Terminal Contract No. 216 — *Erie Basin, Buffalo*

This contract is for constructing a frame freight-house at Erie basin, Buffalo. It was awarded to the Savage Construction Co.,

being signed on July 9, 1918. Construction work began in July, 1918. The engineer's preliminary estimate was $10,000.00, the contractor's bid, $9,899.00. Excess quantities to the value of $295.00 have been authorized by the Canal Board. The value of work done during the year is $10,116.00 The work was accepted November 13, 1918, and the final account, amounting to $10,116.00, was approved by the Canal Board November 13, 1918. The amount paid on extra work orders, to date is $1,949.00.

Elias H. Anderson, Assistant Engineer, was in charge.

An extra work order dated October 24, 1918, provides for doing certain painting and electrical work and building sway braces, runways and office partition. The final account, amounting to $1,949.00, was approved by the Canal Board February 26, 1919.

This freight-house is 200 feet long by 32 feet wide and has track connections on the north side. Contract work was completed in October, 1918.

Terminal Contract No. 113

This contract is for furnishing electric capstans and trolley hoists at various canal terminals. Four capstans and one trolley hoist are to be delivered at Erie basin, Buffalo. It was awarded to the General Electric Co., being signed on June 9, 1919. The engineer's preliminary estimate was $15,000.00, the contractor's bid, $14,090.00.

No machinery has yet been delivered.

Terminal Contract No. 53 — *Ohio Basin, Buffalo*

This contract is for constructing a terminal at Ohio basin, Buffalo. It was awarded to the Walsh Construction Co., being signed on October 27, 1916. Construction work began in June, 1917. The engineer's preliminary estimate was $571,800.00, the contractor's bid, $532,584.00. The contract price as modified by alteration No. 1 is $597,984.00.

Elwin G. Speyer, Assistant Engineer, is in charge.

Under authority of chapter 585, Laws of 1918, this contract was canceled by the Canal Board on July 24, 1918. The cancelation became effective October 9, 1918, on approval of the Canal Board, the contractor having filed a stipulation of his compliance

with the law. The actual cost of the work from April 7, 1917, to October 9, 1918, was $122,731.84 and payment of balance due on this amount was authorized by the Canal Board on May 21, 1919. No work was done prior to April 7, 1917.

The contractor is completing the work and the total payments to date, including extra work orders, are $387,512.84.

Construction work, which had been suspended on December 14, 1917, owing to war conditions, was resumed in August, 1918. During the year the retaining wall along the south end of the basin was completed, the abutments for the bascule bridge were completed, with the exception of the concrete slab on the north abutment, and foundations for the operator's cabin and two sections of wall adjacent to the abutment on the north side of the slip were completed. Due to a strike the contract was shut down during the month of May. Steel to be embedded in concrete, steel floor-beams, ladders, brackets and a safety gate have been delivered on the site. The amount of work to be done under this contract has been limited to the completion of dockwall along the south shore of the basin, the construction of seven sections of wall along Dead creek entrance and the building of the bascule bridge.

Terminal Contract No. 106

This contract is for furnishing fourteen two-ton steam tractor cranes for Barge canal terminals. The contract was awarded to John F. Byers Machine Co., being signed on February 14, 1918. The engineer's preliminary estimate was $5,250.00 per crane, the contractor's bid, $5,265.00 per crane. The contract price as modified by alteration No. 1 is $5,515.00 per crane. The value of the work done at Buffalo during the year is $5,515.00. The work was accepted September 24, 1918, and the final account, amounting to $22,060.00, Buffalo, Lockport and Tonawanda, was approved by the Canal Board October 9, 1918.

Elias H. Anderson, Assistant Engineer, was in charge.

Last year one crane was delivered at Buffalo, one at Tonawanda and one at Lockport. This year another crane has been delivered at Buffalo, completing the contract relative to the Western Division.

THE FOLLOWING STATEMENTS SHOW THE NAME, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE WESTERN DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES FOR THE FISCAL YEAR ENDED JUNE 30, 1919.

Ordinary Repairs to Canals — Erie Canal

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
F. P. Williams	Division engineer	$4,800 per year	$2,520 00	$495 12	$3,015 12
L. C. Hulburd	Division engineer	4,800 per year	2,640 00	160 92	2,800 92
Waldo G. Wildes	Senior assistant engineer	3,300 per year	2,508 28		2,508 28
Anna M. Lorscheider	Stenographer	1,500 per year	1,612 50		1,612 50
E. Quans	Office assistant	1,020 per year	59 22		59 22
			$9,340 00	$656 04	$9,996 04
Incidental Expenses					
Postage				$0 34	
Telephone and telegraph				2 46	
Miscellaneous				1 16	
					$3 96
Total					$10,000 00

Construction of Barge Canal — Erie Canal

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	*Services	Travel	Total
L. C. Hulburd	Division engineer	$4,800 per year		$63 62	$63 62
Edward Anderberg	Senior assistant engineer	3,300 per year	$20 17	41 78	61 95
B. E. Failing	Senior assistant engineer	3,540 per year	1,784 75	96 80	1,881 55
L. S. Hulburd	Senior assistant engineer	3,300 per year	907 50	9 49	916 99
A. R. Morse	Senior assistant engineer	3,300 per year	3,300 50		3,300 50
A. E. Steere	Senior assistant engineer	3,300 per year	3,508 47	158 54	3,667 01
Waldo G. Wildes	Senior assistant engineer	3,300 per year	1,029 22	43 47	1,082 69
Lewis A. Keil	Cashier	2,100 per year	2,257 50	18 36	2,275 86
Frank V. Searls	Estimate clerk	1,920 per year	1,623 39		1,623 39
W. D. Gartland	Stenographer	1,320 per year	758 59		758 59
Mary MacArthur	Stenographer	1,200 per year	330 00		330 00
M. Agnes Maloney	Stenographer	900 per year	247 50		247 50
Elizabeth S. White	Stenographer	1,200 per year	1,120 05		1,120 05
C. L. Baldwin	Assistant engineer	2,580 per year	2,773 50	146 83	2,920 33
D. E. Bellows	Assistant engineer	2,580 per year	2,773 50	956 58	3,730 08
W. W. Brown	Assistant engineer	2,160 per year	2,229 10	409 67	2,638 77
R. W. Cady	Assistant engineer	2,580 per year	2,079 77	380 40	2,460 17
R. D. Cameron	Assistant engineer	2,340 per year	1,828 05		1,828 05
C. R. De Graff	Assistant engineer	2,580 per year	668 35		668 35
Gordon Edson	Assistant engineer	2,580 per year	2,389 51	44 75	2,434 26
C. E. Elmendorf	Assistant engineer	2,580 per year	653 59	6 80	660 39
L. G. Fisher	Assistant engineer	2,340 per year	1,689 12	168 13	1,857 25
F. W. Madigan	Assistant engineer	2,580 per year	2,657 28	191 54	2,848 82

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal — Erie Canal — (Continued)

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	*Services	Travel	Total
Frank T. Marsh	Assistant engineer	$2,340 per year	$2,273 32	$11 76	$2,285 08
H. N. Metzger	Assistant engineer	2,340 per year	675 78	69 86	745 64
A. S. Milinowski	Assistant engineer	2,580 per year	2,773 50	577 30	3,350 80
Lester P. Slade	Assistant engineer	2,340 per year	2,164 19	....	2,164 19
J. Seward Summers	Assistant engineers	2,580 per year	2,284 48	45 96	2,330 44
Arthur S. Whitbeck	Assistant engineer	2,580 per year	2,773 50	72 12	2,845 62
R. W. Anderson	Junior assistant engineer	1,560 per year	1,483 99	....	1,483 99
E. C. Ansley	Junior assistant engineer	1,800 per year	1,935 00	....	1,935 00
W. J. Bell	Junior assistant engineer	1,320 per year	51 86	28 95	80 81
Wm. F. Burke	Junior assistant engineer	1,320 per year	50 74	....	50 74
W. J. Burns	Junior assistant engineer	1,800 per year	1,935 00	....	1,935 00
Charles L. Chapman	Junior asst. engineer (provisional)	1,200 per year	93 55	....	93 55
A. B. Chappell	Junior assistant engineer	1,680 per year	1,806 00	....	1,806 00
Edmund A. Close	Junior assistant engineer	1,680 per year	480 63	....	480 63
J. F. Cullen	Junior assistant engineer	1,200 per year	66 00	....	66 00
Thomas L. Curtin	Junior assistant engineer	1,440 per year	521 13	....	521 13
B. S. Davenport	Junior assistant engineer	1,560 per year	746 90	....	746 90
J. R. Eckhardt	Junior assistant engineer	1,680 per year	479 61	7 65	487 26
J. Frank Egan	Junior assistant engineer	1,320 per year	573 78	....	573 78
Fred C. Facer	Junior assistant engineer	1,800 per year	300 00	....	300 00
Joseph H. Friedman	Junior assistant engineer	1,320 per year	566 50	....	566 50
W. H. Ginnity	Junior assistant engineer	1,800 per year	1,935 00	....	1,935 00
Charles E. Heydt	Junior assistant engineer	1,680 per year	222 31	....	222 31
H. R. Horton	Junior assistant engineer	1,200 per year	35 36	31 46	66 82
Joseph W. Howe	Junior assistant engineer	1,680 per year	1,682 50	....	1,682 50
Neil D. Hyde	Junior assistant engineer	1,560 per year	46 13	....	46 13
Alameth Kay	Junior asst. engineer (provisional)	1,560 per year	520 00	....	520 00
Edward J. Kelley	Junior assistant engineer	1,440 per year	1,454 00	....	1,454 00
Fred G. Kimball	Junior assistant engineer	1,680 per year	1,667 50	....	1,667 50
Michael Kovar	Junior assistant engineer	1,320 per year	382 51	....	382 51
J. F. Larney	Junior assistant engineer	1,440 per year	208 87	....	208 87
L. John Long	Junior assistant engineer	1,320 per year	1,439 90	226 91	1,666 81
Raymond M. Lynd	Junior asst. engineer (provisional)	1,200 per year	210 92	....	210 92
F. B. McLean	Junior assistant engineer	1,200 per year	858 00	....	858 00
Frank J. McMahon	Junior assistant engineer	1,200 per year	432 90	....	432 90
S. A. Miller	Junior assistant engineer	1,800 per year	1,811 50	....	1,811 50
W. R. Miller	Junior assistant engineer	1,440 per year	52 42	....	52 42
D. M. Miner	Junior assistant engineer	1,800 per year	574 84	....	574 84
J. E. Morrell	Junior assistant engineer	1,200 per year	60 68	....	60 68
C. V. O'Malley	Junior assistant engineer	1,800 per year	563 45	....	563 45
Jno. J. Phalan	Junior assistant engineer	1,560 per year	1,222 39	2 05	1,224 44
O. J. Pierce	Junior assistant engineer	1,680 per year	1,129 27	....	1,129 27
W. W. Redfern	Junior assistant engineer	1,320 per year	75 00	....	75 00
Herbert S. Roberts	Junior assistant engineer	1,440 per year	344 96	....	344 96
H. A. Shafer	Junior assistant engineer	1,680 per year	1,035 10	5 23	1,040 33
D. T. Simpson	Junior assistant engineer	1,680 per year	280 00	....	280 00
J. A. Sloat	Junior assistant engineer	1,800 per year	777 90	51 01	828 91
Jacob Smertenko	Junior assistant engineer	1,320 per year	1,419 00	....	1,419 00
Tracy B. Smith	Junior assistant engineer	1,800 per year	1,550 88	....	1,550 88
Charles S. Sterling	Junior assistant engineer	1,560 per year	1,018 55	....	1,018 55
H. R. Topping	Junior assistant engineer	1,800 per year	165 76	19 38	185 14
Powell Wall	Junior assistant engineer	1,560 per year	20 43	....	20 43
C. M. Weinheimer	Junior asst. engineer (provisional).	1,200 per year	119 36	....	119 36
Edmond A. Weiss	Junior assistant engineer	1,320 per year	1,325 50	....	1,325 50
H. J. Whitman	Junior assistant engineer	1,800 per year	1,935 00	....	1,935 00
Oswald R. Whyte	Junior assistant engineer	1,440 per year	130 88	....	130 88
J. F. Williamson	Junior asst. engineer (provisional)	1,200 per year	403 23	....	403 23
Alice E. Yale	Junior asst. engineer (provisional)	1,200 per year	153 23	....	153 23
W. J. Zabel	Junior assistant engineer	1,800 per year	1,214 01	....	1,214 01
Charles R. Zorsch	Junior assistant engineer	1,800 per year	1,935 00	....	1,935 00
Lynn H. Barrows	Engineering assistant	1,080 per year	665 64	....	665 64
Edgar M. Birdsall	Engineering assistant	840 per year	52 50	....	52 50
E. J. Bullis	Engineering assistant	1,020 per year	156 95	....	156 95
Walter R. Glock	Engineering assistant	900 per year	266 13	....	266 13
F. G. Hempel	Engineering assistant	1,080 per year	1,171 50	....	1,171 50
P. M. Howe	Engineering assistant	1,080 per year	126 41	....	126 41
Solomon Leibowitz	Engineering assistant	840 per year	77 00	....	77 00
W. F. Lysett	Engineering assistant	1,080 per year	264 00	....	264 00
Patrick J. Murray	Engineering assistant (provisional)	840 per year	161 52	....	161 52
F. J. O'Connor	Engineering assistant	1,080 per year	606 77	....	606 77

* Includes additional compensation of 10 per cent allowed above base rate

Construction of Barge Canal — Erie Canal — (Concluded)

Chapter 147, Laws of 1903, and amendatory laws

NAME	Rank	Rate of compensation	*Services	Travel	Total
Joseph J. Raduciner	Engineering assistant	$840 per year	$220 71		$220 71
Frank M. Sisson	Engineering assistant	1,080 per year	137 32		137 32
Hugh J. Weir	Engineering assistant	1,080 per year	1,118 52		1,118 52
George M. Harrer	Inspector of engineering works	1,560 per year	150 97		150 97
James Sim	Inspector of engineering works	1,560 per year	1,677 00		1,677 00
W. A. Walter	Inspector of engineering works	1,560 per year	1,677 00		1,677 00
Ernest F. Hamilton	Boatman	3 00 per day	313 50		313 50
John Hano	Boatman	3 00 per day	194 70		194 70
Samuel Kaiser	Boatman	3 00 per day	171 60		171 60
Arthur Knapp	Boatman	3 00 per day	184 80		184 80
C. Kumro	Boatman	3 00 per day	636 90		636 90
J. H. McCabe	Boatman	3 00 per day	650 10		650 10
M. McConnell	Boatman	3 00 per day	960 30		960 30
John Riley	Boatman	3 00 per day	1,017 50		1,017 50
Richard Stanton	Boatman	3 00 per day	1,036 20		1,036 20
Frank W. Wadley	Boatman	3 00 per day	1,151 70		1,151 70
William A. Brick	Laborer	2 50 per day	635 25		635 25
William Brown	Laborer	2 50 per day	745 25		745 25
M. J. Connolly	Laborer	2 50 per day	434 50		434 50
Sidney Z. Davidson	Laborer	2 50 per day	38 50		38 50
George F. Doyle	Laborer	2 50 per day	508 75		508 75
Edward H. Gleason	Laborer	2 50 per day	178 75		178 75
Raymond J. Goldring	Laborer	2 50 per day	242 00		242 00
Ralph Whitney Goosnell	Laborer	2 50 per day	148 50		148 50
Francis E. Green	Laborer	2 50 per day	154 00		154 00
Smith Hulburt	Laborer	2 50 per day	948 75		948 75
Henry J. Killian	Laborer	2 50 per day	434 50		434 50
Lester Lavine	Laborer	2 50 per day	880 00		880 00
Edward F. Murr	Laborer	2 50 per day	860 75		860 75
Arthur W. Phillips	Laborer	2 50 per day	165 00		165 00
Raymond J. Quandt	Laborer	2 50 per day	756 25		756 25
Carlton F. Reule	Laborer	2 50 per day	591 25		591 25
Matthew Rigney	Laborer	2 50 per day	437 25		437 25
Raymond J. Riley	Laborer	2 50 per day	500 50		500 50
George D. Rivers	Laborer	2 50 per day	860 75		860 75
W. H. Rundle	Laborer	2 50 per day	357 50		357 50
Elmer R. Stoll	Laborer	2 50 per day	46 75		46 75
Sydney W. Towe	Laborer	2 50 per day	442 75		442 75
Lewis Van Allan	Laborer	2 50 per day	863 50		863 50
E. R. Weed	Laborer	2 50 per day	893 75		893 75
John J. Nugent	Chauffeur	1,500 per year	1,612 50	$266 67	1,879 17
E. Quans	Office assistant	1,020 per year	1,038 34		1,038 34
J. Horton Begy	Gage reader	120 per year	120 00		120 00
H. K. Compson	Gage reader	84 per year	84 00		84 00
C. H. Harrison	Gage reader	60 per year	60 00		60 00
Patrick J. Slavin	Gage reader	60 per year	60 00		60 00
Homer Snell	Gage reader	72 per year	72 00		72 00
Carl Tuscher	Gage reader	60 per year	60 00		60 00
			$121,167 94	$4,153 07	$125,321 01

Incidental Expenses

Instruments and tools	$101 72	
Office rent	3,350 50	
Fuel and light	152 16	
Stationery and printing	300 09	
Postage	381 43	
Telephone and telegraph	1,187 69	
Miscellaneous	7,686 38	
		13,159 97
Total		$138,480 98

* Includes additional compensation of 10 per cent allowed above base rate.

Construction of Barge Canal Terminals

Chapter 746, Laws of 1911, and amendatory laws

NAME	Rank	Rate of compensation	*Services	Travel	Total
B. E. Failing	Senior assistant engineer	$3,300 per year	$1,773 75	$76 35	$1,850 10
F. V. Searls	Estimate clerk	1,920 per year	389 51	5 77	395 28
W. D. Gartland	Stenographer	1,200 per year	152 58	....	152 58
Mary MacArthur	Stenographer	1,200 per year	770 00	....	770 00
M. Agnes Maloney	Stenographer	900 per year	295 40	....	295 40
Elias H. Anderson	Assistant engineer	2,580 per year	2,169 54	62 29	2,231 83
C. E. Elmendorf	Assistant engineer	2,580 per year	748 04	....	748 04
F. W. Madigan	Assistant engineer	2,580 per year	116 22	....	116 22
Frank T. Marsh	Assistant engineer	2,340 per year	....	5 82	5 82
H. N. Metzger	Assistant engineer	2,340 per year	374 56	124 67	499 23
Lester P. Slade	Assistant engineer	2,160 per year	95 81	....	95 81
Elwin G. Speyer	Assistant engineer	2,580 per year	1,847 98	131 00	1,978 98
J. S. Summers	Assistant engineer	2,580 per year	466 14	18 33	484 47
F. J. Wilbur	Assistant engineer	2,580 per year	2,554 80	....	2,554 80
C. J. Bean	Junior assistant engineer	1,800 per year	1,911 43	2 15	1,913 58
C. B. Bennett	Junior assistant engineer (provisional)	1,200 per year	116 13	....	116 13
Byron T. Bisgood	Junior assistant engineer (provisional)	1,560 per year	65 00	....	65 00
Thomas L. Curtin	Junior assistant engineer	1,320 per year	230 29	....	230 29
Walter G. Dubey	Junior assistant engineer	1,560 per year	1,017 07	....	1,017 07
Charles E. Heydt	Junior assistant engineer	1,560 per year	212 19	....	212 19
Neil D. Hyde	Junior assistant engineer	1,560 per year	286 00	....	286 00
F. B. McLean	Junior assistant engineer	1,200 per year	110 00	....	110 00
W. R. Miller	Junior assistant engineer	1,560 per year	76 27	....	76 27
C. V. O'Malley	Junior assistant engineer	1,800 per year	58 55	....	58 55
Jno. J. Phalan	Junior assistant engineer	1,440 per year	161 31	....	161 31
O. J. Pierce	Junior assistant engineer	1,560 per year	538 23	....	538 23
W. W. Redfern	Junior assistant engineer	1,200 per year	443 55	....	443 55
M. B. Severance	Junior assistant engineer	1,560 per year	419 35	....	419 35
J. A. Sloat	Junior assistant engineer	1,800 per year	88 00	....	88 00
Tracy B. Smith	Junior assistant engineer	1,800 per year	378 79	....	378 79
I. L. Stalker	Junior assistant engineer	1,560 per year	1,035 04	....	1,035 04
C. S. Sterling	Junior assistant engineer	1,440 per year	314 51	....	314 51
H. R. Topping	Junior assistant engineer	1,800 per year	141 23	97 86	239 09
Powell Wall	Junior assistant engineer	1,680 per year	696 61	....	696 61
Oswald R. Whyte	Junior assistant engineer	1,320 per year	584 28	....	584 28
George M. Harrer	Inspector of engineering works	1,560 per year	1,526 03	....	1,526 03
Samuel Kaiser	Boatman	3 00 per day	557 70	....	557 70
Arthur Knapp	Boatman	3 00 per day	323 40	....	323 40
J. H. McCabe	Boatman	3 00 per day	36 30	....	36 30
David R. Petrikin	Boatman	3 00 per day	1,032 90	....	1 032 90
George F. Doyle	Laborer	2 50 per day	258 50	....	258 50
W. H. Rundle	Laborer	2 50 per day	503 25	....	503 25
			$24,876 24	$524 24	$25,400 48

Incidental Expenses

Office rent	$1,007 00	
Fuel and light	32 54	
Stationery and printing	2 90	
Postage	33 19	
Telephone and telegraph	107 25	
Miscellaneous	397 58	
		1,580 46
Total		$26,980 94

*Includes the additional compensation of ten per cent allowed above the base rate.

Chadakoin River Improvement

Chapter 758, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917; chapter 644, part 5, Laws of 1919

NAME	Rank	Rate of compensation	*Services	Travel	Total
H. N. Metzger	Assistant engineer	$2,340 per year	$173 76	$45 30	$219 06
W. W. Redfern	Junior assistant engineer	1,200 per year	7 21		7 21
Powell Wall	Junior assistant engineer	1,560 per year	64 58		64 58
Oswald R. Whyte	Junior assistant engineer	1,320 per year	141 95	8 45	150 40
Samuel Kaiser	Boatman	3 00 per day	3 30		3 30
Horace S. Butts	Gage reader	120 per year	110 00		110 00
			$500 80	$53 75	$554 55
Incidental Expenses					
Miscellaneous					50
Total					$555 05

Ellicott Creek Improvement

Chapter 624, Laws of 1913; chapter 728, Laws of 1915; chapters 181 and 760, Laws of 1917

NAME	Rank	Rate of compensation	*Services	Travel	Total
R. W. Cady	Assistant engineer	$2,580 per year	$693 73	$3 05	$696 78
D. T. Simpson	Junior assistant engineer	1,680 per year	319 67		319 67
C. M. Weinheimer	Junior assistant engineer (provisional)	1,200 per year	100 00		100 00
Lynn H. Barrows	Engineering assistant	1,080 per year	438 69		438 69
C. Kumro	Boatman	3 00 per day	402 60		402 60
W. A. Brick	Laborer	2 50 per day	162 25		162 25
			$2,116 94	$3 05	$2,119 99
Incidental Expenses					
Office rent				$42 00	
Stationery and printing				1 04	
Postage				2 97	
Telephone and telegraph				11 10	
Miscellaneous				18 69	
					75 80
Total					$2,195 79

* Includes the additional compensation of ten per cent allowed above the base rate.

Hertel Avenue Bridge, Buffalo

Chapter 761, Laws of 1917

NAME	Rank	Rate of compensation	*Services	Travel	Total
Elias H. Anderson	Assistant engineer	$2,580 per year	$104 26	$21 20	$125 46
Gordon Edson	Assistant engineer	2,580 per year	68 66	....	68 66
Lester P. Slade	Assistant engineer	2,160 per year	57 48	....	57 48
F. J. Wilbur	Assistant engineer	2,580 per year	61 03	....	61 03
Frank V. Searls	Estimate clerk	1,920 per year	51 10	....	51 10
C. J. Bean	Junior assistant engineer	1,800 per year	23 57	1 30	24 87
Walter G. Dubey	Junior assistant engineer	1,440 per year	491 93	....	491 93
Neil D. Hyde	Junior assistant engineer	1,560 per year	143 00	....	143 00
I. L. Stalker	Junior assistant engineer	1,560 per year	470 12	....	470 12
Oswald R. Whyte	Junior assistant engineer	1,200 per year	14 20	....	14 20
E. Quans	Office assistant	1,020 per year	15 08	....	15 08
			$1,500 43	$22 50	$1,522 93
Incidental Expenses					
Postage				$0 49	
Telephone and telegraph				40	
Miscellaneous				101 96	
					102 85
Total					$1,625 78

Eighteen-Mile Creek Culvert, Lockport

Chapters 181 and 626, Laws of 1917

ITEM	Total
Incidental Expenses	
Stationery and printing	$55 80

Griffin Creek Improvement, Cuba

Chapter 565, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
C. E. Elmendorf	Assistant engineer	$2,580 per year	$212 06	$117 31	$329 37
Jno. J. Phalan	Junior assistant engineer	1,440 per year	35 19	....	35 19
Hugh J. Weir	Engineering assistant	1,020 per year	6 23	....	6 23
E. F. Murr	Laborer	2 50 per day	8 25	....	8 25
			$261 73	$117 31	$379 04
Incidental Expenses					
Livery				$5 00	
Miscellaneous				13 36	
					18 36
Total					$397 40

* Includes the additional compensation of ten per cent allowed above base rate.

Blue Line Surveys

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
L. S. Hulburd	Senior assistant engineer	$3,300 per year	$1,697 91	$57 58	$1,755 49
Mary MacArthur	Stenographer	1,200 per year	220 00	....	220 00
O. L. Burdett	Assistant engineer	2,340 per year	471 99	....	471 90
C. E. Elmendorf	Assistant engineer	2,580 per year	1,166 97	....	1,166 97
L. G. Fisher	Assistant engineer	2,340 per year	826 38	....	826 38
Frank T. Marsh	Assistant engineer	2,340 per year	242 18	....	242 18
F. J. Wilbur	Assistant engineer	2,580 per year	157 67	....	157 67
R. W. Anderson	Junior assistant engineer	1,440 per year	25 01	....	25 01
Wm. F. Burke	Junior assistant engineer	1,320 per year	80 67	....	80 67
Michael Kovar	Junior assistant engineer	1,440 per year	165 94	....	165 94
W. R. Miller	Junior assistant engineer	1,680 per year	608 37	....	608 37
C. V. O'Malley	Junior assistant engineer	1,800 per year	779 94	....	779 94
J. A. Sloat	Junior assistant engineer	1,800 per year	556 03	19 75	575 78
I. L. Stalker	Junior assistant engineer	1,680 per year	148 50	....	148 50
H. R. Topping	Junior assistant engineer	1,800 per year	725 59	74 83	800 42
E. J. Bullis	Engineering assistant	1,080 per year	412 53	....	412 53
Edward J. Moran	Engineering assistant	960 per year	85 25	....	85 25
E. Quans	Office assistant	1,020 per year	9 36	....	9 36
J. H. McCabe	Boatman	3 00 per day	323 40	....	323 40
M. McConnell	Boatman	3 00 per day	141 90	....	141 90
Freeman S. Barclay	Laborer	2 50 per day	41 25	....	41 25
R. J. Quandt	Laborer	2 50 per day	77 00	....	77 00
Carlton F. Reule	Laborer	2 50 per day	41 25	....	41 25
			$9,000 00	$152 16	$9,152 16
Incidental Expenses					
Stationery and printing				$20 82	
Livery				143 50	
Postage				39 46	
Office rent				774 50	
Telephone and telegraph				60 95	
Miscellaneous				308 61	
					1,347 84
Total					$10,500 00

Surveys for State Court of Claims

Chapter 151, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
Elias H. Anderson	Assistant engineer	$2,580 per year	$16 89	$28 39	$45 [illegible]
W. W. Brown	Assistant engineer	2,160 per year	92 90	6 18	99 [illegible]
Gordon Edson	Assistant engineer	2,580 per year	....	1 72	1[illegible]
C. E. Elmendorf	Assistant engineer	2,580 per year	28 67	3 00	31 67
H. N. Metzger	Assistant engineer	2,340 per year	473 35	81 07	554 42
Lester P. Slade	Assistant engineer	2,160 per year	12 77	....	12 77
Elwin G. Speyer	Assistant engineer	2,340 per year	678 52	63 97	742 49
J. S. Summers	Assistant engineer	2,580 per year	22 88	2 50	25 38
L. John Long	Junior assistant engineer	1,320 per year	12 10	2 95	15 05
F. B. McLean	Junior assistant engineer	1,200 per year	3 55	....	3 55
Tracy B. Smith	Junior assistant engineer	1,800 per year	5 33	6 11	11 44
Powell Wall	Junior assistant engineer	1,560 per year	35 75	....	35 75
Oswald R. Whyte	Junior assistant engineer	1,320 per year	80 99	....	80 99
Samuel Kaiser	Boatman	3 00 per day	36 30	....	36 30
			$1,500 00	$195 89	$1,695 89
Incidental Expenses					
Postage				$44 77	
Office rent				370 00	
Telephone and telegraph				32 05	
Miscellaneous				7 29	
					454 11
Total					$2,150 00

* Includes the additional compensation of ten per cent allowed above base rate.

Eighteen-Mile Creek Survey, Niagara County

Chapter 425, Laws of 1918

NAME	Rank	Rate of compensation	*Services	Travel	Total
H. N. Metzger	Assistant engineer	$2,340 per year	$556 27	$373 75	$930 02
Byron T. Bisgood	Junior assistant engineer (provisional)	1,560 per year	91 00		91 00
F. B. McLean	Junior assistant engineer	1,200 per year	348 45		348 45
I. L. Stalker	Junior assistant engineer	1,560 per year	13 84		13 84
Oswald R. Whyte	Junior assistant engineer	1,320 per year	310 84		310 84
Alice E. Yale	Junior assistant engineer (provisional)	1,200 per year	61 29	96 60	157 89
Lynn H. Barrows	Engineering assistant	1,080 per year	83 67		83 67
Samuel Kaiser	Boatman	3 00 per day	211 20		211 20
Wm. A. Brick	Laborer	2 50 per day	13 75		13 75
			$1,690 31	$470 35	$2,160 66
Incidental Expenses					
Livery				$132 25	
Postage				1 34	
Miscellaneous				39 49	
					173 08
Total					$2,333 74

SUMMARY

The foregoing tables are summarized as follows:

Ordinary Repairs to Canal

1.	Erie canal, chapter 151, Laws of 1918	$10,000 00

Construction of Barge Canal

2.	Erie canal, chapter 147, Laws of 1903, and amendatory laws	138,480 98

Construction of Barge Canal Terminals

3.	Erie canal, chapter 746, Laws of 1911, and amendatory laws	26,980 94

Special Work

4.	Chadakoin river improvement, chapter 758, Laws of 1913; chapter 728, Laws of 1915; chapter 181, Laws of 1917; chapter 644, part 5, Laws of 1919	555 05
5.	Ellicott creek improvement, chapter 624, Laws of 1913; chapter 728, Laws of 1915; chapters 181 and 760, Laws of 1917	2,195 79
6.	Hertel avenue bridge, Buffalo, chapter 761, Laws of 1917	1,625 78
7.	Eighteen-Mile creek culvert, Lockport, chapters 181 and 626, Laws of 1917	55 80
8.	Griffin creek improvement, Cuba, chapter 565, Laws of 1918	397 40

Special Surveys

9.	Blue line surveys, chapter 151, Laws of 1918	10,500 00
10.	Surveys for State Court of Claims, chapter 151, Laws of 1918	2,150 00
11.	Eighteen-Mile creek survey, Niagara county, chapter 425, Laws of 1918	2,333 74
	Total	$195,275 48

* Includes the additional compensation of ten per cent allowed above the base rate.

REPORT OF TESTS

REPORT OF THE LAND BUREAU

REPORT OF TESTS

TESTING LABORATORY — GEOLOGICAL HALL

ALBANY, N. Y., *July* 1, 1919.

HON. FRANK M. WILLIAMS, *State Engineer and Surveyor:*

Sir.— I have the honor to submit the following report of the work of the testing laboratory of your Department for the fiscal year ended June 30, 1919.

The work of the laboratory during the past year has been more extensive than the year before, for, not only did the volume of work increase, but the variety of the work also increased. As heretofore, the testing of cement and other concrete materials forms the bulk of the testing, but the ratio of cement testing to other testing is gradually decreasing. The tests and analyses of the wide variety of other construction materials makes the laboratory of special and an increasing value for its effect in all phases of constructions. Opportunities for tests and research on the effect of time and weather on several of these materials secure for the laboratory a knowledge of value for use by various State departments.

CEMENT TESTS

The work of testing the cement proposed for use on Barge canal work and on some other State works was almost 40 per cent greater this year than last. During the year there have been submitted 3,656 samples of cement, representing 218,533 barrels of cement, of which 96 per cent was tested for the State Engineer's Department and 4 per cent for other State works. It has been found that for promptness of inspection and delivery as well as economy it was advisable to permit shipments frequently to the State Architect's department and to other State work from some bin of cement which had been tested and accepted for use on Barge canal work. Because of this practice considerable more cement was shipped under our inspection to these other works from "Barge canal" bins than the 4 per cent noted above.

The inspection of cement at the mills has long been a large part of the work of this bureau. Such inspection permits the taking of

a smaller proportion of samples to the number of barrels represented. In addition to the saving of time and the number of necessary samples, mill inspection prevents the delivery of any cement upon the work except that which has been tested and accepted. Notwithstanding these advantages there continues to be a considerable amount of cement sampled on the work after delivery and then tested, for some contractors prefer to have it done that way and the specifications permit the contractor to choose. They frequently choose the latter way in the effort to save the per barrel charge made by cement companies for storage in the bins put under the seal of "bin-tested" cement.

Each sample of cement submitted, mixed in the proportion of one part cement to three parts standard quartz sand, was tested for tensile strength at 7-day and 28-day periods. In addition to the tests for tensile strength, each lot of samples was given tests for fineness of grinding, for initial and hard sets, for specific gravity and for soundness, by means of the steam tests, the normal-water test and the normal-air test. Frequently the cements were completely analyzed and are specially checked for sulphuric anhydride ($S O_3$) and magnesia ($Mg O$).

The methods used in making the tests and analyses of cement are those adopted as standard by the American Society for Testing Materials. A slight variation, however, is that, instead of using a blended sample for tests for tensile strength, we still use our own method of testing each sample separately for tensile strength. This method has long proven very satisfactory; in fact, by means of it much poor cement has been discovered which would have stood the tests had all of the samples of a lot been blended and then tested. It has been a special help in securing from the mills a cement that is uniform in quality. This method, however, makes necessary a larger equipment and a more complete system of operation than is necessary under the common method of testing the blended sample. This large and splendid equipment we have in our laboratory. The effort has constantly been made to maintain this complete laboratory with as little expenses as possible, and this laboratory has earned a wide reputation for the accuracy of its results and the efficiency of its inspections.

The specifications of this Department for cement are now those

adopted by the American Society for Testing Materials. While formerly this Department used a crushed quartz sand in making its tests for tensile strength, this laboratory now uses only the standard Ottawa sand. This it can do now, since the contracts let with the specification calling for tests with the crushed quartz sand are all completed and all the active and new contracts call for the use of Ottawa sand.

All results obtained at the end of the 7-day tests of the samples of cement proposed for use on Barge canal work are reported to Mr. F. P. Williams, Special Deputy State Engineer, and, if then thought best, are held for the 28-day tests, the lots being accepted or rejected by him as the results show that the cement passes or fails to pass the requirements of the tests. The reports of all tests of cement for all other Department work (except Barge canal) are submitted to the Deputy State Engineer, Mr. R. G. Finch.

Because this laboratory — through its director — is in such close relationship to the Committee on Cement of the American Society for Testing Materials it has also been making a thorough study of the proposition to substitute compression tests of cement for the present tension tests and it is securing data which will help toward a wise decision on this question.

Of the cement tested and proposed for use all was Portland cement. Nineteen brands of cement were tested and of these 5 were manufactured in New York, 12 in Pennsylvania, 1 in Ohio and 1 in New Jersey.

The method of inspection of cement at the various mills is as follows: When there is to be enough cement to warrant doing so, an inspector is sent to the cement mill to sample cement and inspect shipments. The inspector takes samples from the various parts of the bin or from the conveyor as the cement is being carried to the bin, and each sample is tested in the same way as are the samples taken from cement delivered on the work. The endeavor is to obtain from the sampling and the testing of these samples the "run of the product." As soon as the samples are taken, the inspector places the bin of cement under the seal of this Department and the bin is so sealed that no cement can be added to or taken from it without detection. When the results of the tests

have been secured, the reports are made in the usual way, and then, if the cement is accepted, the bin of cement is assigned to the contract which may have placed an order for the cement. When the contractor needs cement, the inspector at the mill breaks the seal on the bin, inspects the loading of the car or cars, seals these with the Department seal and then reseals the bin of cement. A notice of shipment is forwarded to the laboratory, is examined and approved, if correct, and sent to the senior assistant engineer in charge of the contract to which the cement has been assigned. When the car or cars arrive on the work, the seal of the Department must be broken by the senior assistant engineer in charge or his representative, otherwise the lot of cement must be sampled and tested in the usual way.

SAND TESTS

The thorough examination and tests of the sands and gravels proposed for use on work in the various departments have been continued and the importance of such tests has frequently been fully demonstrated. It has been found that almost all of the available sand and gravel banks along the line of the canal sytsem have been sampled and tested, and with these it is now only necessary to make occasional inspections and tests to ascertain whether or not the quality of the materials from these banks is equal to the samples accepted. Dredging the canal channel has frequently opened a section in which sand and gravel has been of such quality that it has been proposed for use. Spoils-banks made of this material have been examined and tested for the quality of the sand. Many other banks throughout the State, but not along the canal system, have also been tested. The results of the tests of these materials have also been found to be of value by other State departments.

The tests made are as follows: The sands are examined under the microscope for those elements that give the sand its characteristics. The other tests are for voids, loam and silt, fineness or grading, and strength—both tensile and compressive—with cement. The latter are made from the sand in its natural condition and also washed; and the cement used is a "standard" cement, made by mixing together in the laboratory several brands of cement

which have given results nearly alike in the regular tests. All tests for strength cover at least 28 days, but many long-time tests are being carried. Considerable attention has been given to the methods used in making the tests and it is believed that the most accurate methods are being used.

The testing of sand includes also the testing and examination of the gravel in the sand and also the testing of substitutes for sand and gravel, such as screenings, iron-ore tailings and slag.

CONCRETE TESTS

Along with the testing of the cement and fine aggregates, tests have been carried along on coarse aggregates, such as various kinds of crushed rocks, gravels, slag, etc., by means of compression tests on concrete made up of these materials. Tests for the effects of varying the proportions, the consistencies of the mixes, the methods of molding and capping and of storing the test-pieces have been made. Also tests have been made of samples of concrete made up as it was being placed in the structures and sent in from the various works.

TESTS OF OTHER MATERIALS

Besides those already reported, there have been made a large variety of tests and analyses of other construction and building materials. Among the materials thus examined were stones, artificial building stone, mortars and colorings, wooden paving blocks, granite and sandstone paving blocks, paving bricks, face bricks, chimney brick, both paving and roofing bituminous materials, hollow tile, galvanized conduits and fixtures, waterproofings of various types, wood preservatives, paints, varnishes and puttys. Research work has been continued on laitance and on the efflorescence and incrustations on concrete, and microscopic examinations and analyses in the laboratory on these materials have also been continued.

FIELD INSPECTIONS

In addition to directing the work of the laboratory and the mill inspections, the undersigned has made field inspections of the concrete and concrete materials being used on many of the Barge canal contracts where concrete was being placed. Particular atten-

tion has been given to the sources of supply of the gravels, sand and stone being used in the concrete. A more definite knowledge is thus gained than is possible through a laboratory sample alone, but with both tests and field inspection absolute knowledge of the materials is gained. Inspection of its actual use is also a help in considering the points of merit or demerit in the material. Inspections of concrete that has been in place for some time have been made in order to study the condition and the wear of the concrete, for the purpose of securing information on the various theories that have been advanced from time to time on the changes that may take place in concrete. Some interesting and profitable studies have thus been made. The construction of concrete barges for proposed use on the Barge canal have also been watched and inspected during the various stages of their construction.

The development of the specifications for and the methods of tests of the materials of construction is a natural sequence of the knowledge secured in the analyses, tests and inspections, so this has frequently been a feature of the work we have been called upon to do.

Respectfully submitted,
RUSSELL S. GREENMAN,
Senior Assistant Engineer, in charge of Tests.

REPORT OF THE LAND BUREAU

STATE OF NEW YORK

DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR

LAND BUREAU

ALBANY, N. Y., *July* 1, 1919.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor:*

Sir.— Herewith I submit a report of the work of the Land Bureau for the fiscal year ended June 30, 1919.

The sale of State land that is ordered sold by the Commissioners of the Land Office is conducted by this bureau. Ten public auctions were held and the sum of $7,291.55 realized therefrom. A detailed statement of the sales is appended. The average sale for the previous ten years is $11,835.00.

Maps of all grants of land under water made by the Commissioners of the Land Office and the Legislature are on file in this bureau and new grants are added when made by the Land Board.

The early records, maps and field notes filed in this bureau are being constantly examined by the public and are of great and increasing value.

Twelve modern atlases of various counties of the State have been added to the library during the year and the need of additional room is felt.

Respectfully submitted,

MERRITT PECKHAM, JR.

Land Clerk.

TABLE OF SALES CONDUCTED BY THE LAND BUREAU DURING THE FISCAL YEAR ENDED JUNE 30, 1919

Date of sale	Purchaser	Location	Lot	Acres	Tax or mortgage	Price
1918						
July 11	Jaspare Sciuto	Lockport	1 city lot	......	Tax	$133 00
July 16	Tunis A. Swick	Tompkins county	....	4.037	Tax	277 00
Aug. 6	Louie Smith	Chautauqua county	....	66	Mortgage	802 00
Aug. 9	Wesley W. Sternberg	Madison county	....	75	Mortgage	825 00
Oct. 1	Standard Oil Company	Syracuse	1 city lot	......	Original	690 00
Nov. 13	Carrie Askanasy	Kings county	2 city lots	......	Tax	48 50
1919						
Jan. 7	Leslie W. Paine	Ontario county	....	156	Mortgage	1,500 00
Mar. 5	Cathrine Noonan	Kings county	3 city lots	......	Tax	76 05
April 9	City of Syracuse	Syracuse	1 city lot	......	Original	2,707 00
May 29	Crucible Steel Co.	Syracuse	1 city lot	......	Canal	233 00
	Total	....	....	......	....	$7,291 55

REPORT

ON

EXAMINATION AND SURVEY OF EIGHTEEN-MILE CREEK WITH ESTIMATES OF COST OF PROPOSED IMPROVEMENTS

REPORT ON WORK DONE UNDER CHAPTER 425 OF THE LAWS OF 1918, AUTHORIZING THE MAKING OF A SURVEY OF EIGHTEEN-MILE CREEK IN THE COUNTY OF NIAGARA AND MAKING AN APPROPRIATION THEREFOR

By the above named act the State Engineer and Surveyor was authorized "to make such examination and survey of Eighteen-Mile creek north of the line of the Erie canal in the county of Niagara as may be necessary to determine what improvements in the way of channel deepening or straightening of banks may be required to enable the said creek to carry flood waters and overflow from the Erie canal without damage to private property abutting on said creek, and to prepare an estimate of the cost of all such work and improvement."

Under the direction of Mr. F. P. Williams, Division Engineer of the Western Division, Mr. Byron E. Failing, Senior Assistant Engineer, had charge of the making of the necessary surveys, maps and estimates.

Information on file in the Department of the State Engineer was supplemented by field surveys.

Description of Stream

Eighteen-Mile creek rises about two miles south of the city of Lockport and flows northerly through that city, emptying into Lake Ontario at Olcott. It has a drainage area of 85 square miles. The stream passes under the Barge canal about half a mile east of the Lockport locks and for the next 1½ miles it passes through a gorge with a total fall of about 150 feet. From this point to Lake Ontario it has a uniform slope with a fall of 119 feet in about 14 miles as measured along its course.

The drainage area of the creek south of the canal is too small to furnish sufficient water for a practicable water-power development. Water from the canal, however, is wasted into it in sufficient volume to make the development of hydraulic power profitable, and several mills and factories have been located on the stream to utilize such power.

WATER-POWER SITUATION AT LOCKPORT

Between the upper and lower pools of the Barge canal at Lockport there is a fall of about 50 feet. For feeding the canal east of Lockport it is necessary to by-pass a considerable amount of water around the locks. The head being large, the value of the water for power purposes was quickly realized, early in the history of the original canal, and the right to use that water was leased by the State under what is known as the "Kennedy and Hatch lease" in 1826. The terms of this lease are are follows:

Kennedy and Hatch Lease

This indenture made this 25th day of January in the year 1826, between the Canal Commissioners of the State of New York of the first part, and Richard Kennedy of the Town of Lockport and Junius H. Hatch of the City of New York of the second part witnesseth:

That the said canal commissioners in pursuance of the provisions of the act entitled "An Act concerning the Erie and Champlain Canal" and passed April 20th, 1825, and in consideration of the sum hereinafter covenanted to be paid by said Kennedy and Hatch have granted, leased and to farm let, and by these presents do grant, lease and to farm let to said Kennedy and Hatch, their heirs, executors, administrators, and assigns all the surplus waters which without injury to navigation or the security of the canal may be spared from the canal at the head of the locks in the Village of Lockport, to be taken and drawn from the canal at such place and in such manner and discharged into the lower level at such places and in such manner as said canal commissioners shall from time to time deem most advisable for the security of the canal and for the convenience of navigation thereof.

And the said Kennedy and Hatch hereby jointly and severally covenant and engage to pay to the commissioners of the canal fund yearly and every year hereafter on the 1st of January in each year the sum of Two hundred dollars and for the eventual payment thereof they hereby bind themselves, their heirs, executors, administrators and assigns.

It is hereby expressly understood and agreed that the canal

commissioners reserve to themselves and to the legislature the right to limit, control, or wholly resume said waters and all the rights granted by this lease whenever in the opinion of said canal commissioners or of the legislature the safety of the canal and its appendages or the necessary supply of water for the navigation of the canal shall render such limitation, control and resumption necessary.

It is further agreed that if at any time the rent hereby reserved shall remain unpaid for one year after the same shall become due that this lease shall be forfeited to the state and the said commissioners may thereupon relet the said surplus waters to any other person in like manner as if no lease thereof had been executed.

In Witness Whereof the parties of these presents have hereunto set their hands and seals the day and year first above written.

R. KENNEDY [SEAL]
JUNIUS H. HATCH [SEAL]
SAMUEL YOUNG
HENRY SEYMOUR [SEAL]
W. C. BOUCK

Canal Commissioners.

The Hydraulic Race Company is the successor in title to this lease, but it does not claim to own all of the surplus waters. Disputes having arisen between the lessees and other users of surplus water, litigation ensued and on August 27, 1851, a decree was handed down by the Supreme Court in Buffalo fixing the title in the three other parties to a portion of the surplus water in the power canals and tunnels at Lockport. These rights have changed hands several times and at present there are two mills claiming rights which are independent of those of the Hydraulic Race Company. These are the Thompson Milling Company with 96 horse-power and the Franklin Mills Company with the same amount of power. The Hydraulic Race Company does not develop power itself, but leases power rights to the following concerns: Lockport Light, Heat & Power Co., Grigg Bros. Flour Mill, United Paper Board Co., Trevor Manufacturing

Co., Western Block Co., and Thompson Milling Co., which develop in all about 4,000 horse-power and use approximately 900 cubic feet of water per second.

Use and Diversion of Canal Water at Lockport

It is estimated that the maximum amount that will be required for the Barge canal below Lockport will be 1,237 second-feet. Of this, 230 second-feet will be required for lockage with a canal traffic of 10,000,000 tons annually and 400 second-feet with a maximum canal traffic, leaving under these conditions about 900 second-feet as surplus water available for power between the upper and lower levels.

It is apparent, therefore, that the surplus water passing the locks for navigation purposes is practically all used for power at the present time. In addition to the water needed for navigation purposes a diversion of 500 second-feet from the Niagara river by way of Tonawanda creek and the canal was granted by the Secretary of War on August 16, 1907, to the Lockport Hydraulic Company, or as it is now known, the Hydraulic Race Company.

On November 25, 1913, a revocable permit was granted by the State to the Lockport and Newfane Mill Owners Association, Inc., in which the State agreed to discharge the 500 second-feet granted by the Secretary of War into Eighteen-Mile creek, or as much thereof as the creek could carry without damage being done. For this service the State was to receive $7,500 per annum. If for any reason this amount of water could not be furnished, then a pro-rata deduction was to be made, based upon the quantity of water delivered. The Lockport and Newfane Mill Owners Association, Inc., is a corporation composed of about all of the mill owners on Eighteen-Mile creek, together with the Hydraulic Race Company.

EIGHTEEN-MILE CREEK

Capacity of Present Channel

Under Mr. Failing's direction the capacity of Eighteen-Mile creek was found by passing different known quantities down the stream and observing the results. Current-meter measurements were taken at several places to ascertain the velocity. The stream

was cross-sectioned and gage stakes placed about 1,000 feet apart. It was thus ascertained that the channel of the creek would carry 375 second-feet without overflowing its banks. The height of water with 375 second-feet passing was observed and from this information a hydraulic grade line for the water surface was computed for flows of 500 second-feet and 1,000 second-feet with the stream channel in its present condition. Computations were also made to determine the amount of excavation necessary to carry these discharges at the same water-surface elevation as that given by the flow of 375 second-feet. The results of these computations are given in the attached tables, Nos. 1 and 2.

In Tables Nos. 1 and 2 the first column shows the number of the range at which the readings were taken; column No. 2, the distances in feet between ranges; column No. 3, the cubic yards of excavation to enlarge the channel so that the water-surface will not be raised above that for the discharge of 375 second-feet; column No. 4, the estimated excavation in cubic yards per linear foot of stream; column No. 5, the area needed for spoil banks; column No. 6, description of work to be done on the present channel, and column No. 7, the area of land in acres that would be flooded if no excavation is done in the present channel and additional water is allowed to flow over and flood the adjacent banks.

From Olcott to a point about two miles above Collins dam the creek has a sufficient capacity to carry 500 second-feet without doing damage. From this point to the Jackson street bridge it will be necessary to either appropriate the lands flooded or enlarge the channel. If the channel is enlarged, it should be done by widening between ranges 25 and 14, as in that section there is rock in or near the bed of the stream. From range 14, near the Turnpike road, to the Jackson road bridge, at the mouth of the gorge at the Lockport city line, the stream should be deepened instead of widened, as there is no rock near the surface and the deeper channel gives a better section for discharge and at less cost.

The removal of a few bends will not materially increase the capacity of the stream, for it is shallow and has a very rapid flow for its full distance. The straightening of a bend in such a stream improves the condition only in that immediate location and the cost will greatly exceed that of widening or deepening.

From Jackson's bridge to the Barge canal, a distance of a little over one mile, there are eight water-powers and over this section there is no chance of the creek causing damage unless one or more of the dams are raised.

Water-Power Available

Table No. 3 is a tabulation of the developed and undeveloped power on Eighteen-Mile creek, with a flow of 375 second-feet. This table shows that at present with a flow of 375 second-feet there is developed on Eighteen-Mile creek a total of 2,070 horse-power and there is available but undeveloped a total of 7,090 horse-power, making a total of developed and undeveloped power of 9,160 horse-power. In other words, 77 per cent of the available power on Eighteen-Mile creek with a flow of 375 second-feet is undeveloped and not used.

Table No. 4 shows similar data for the flow of 500 second-feet. That is, the development at present is 2,070 horse-power and the undeveloped power 10,150 horse-power or a total possible development of 12,220 horse-power. It should be borne in mind that the amounts of undeveloped power are based upon the total possible fall at the various sites and might not be fully realized in actual construction.

By personal interviews with the various power owners or their managers Mr. Failing obtained the following data regarding the present condition of the various plants:

Present Condition of Plants

50-FOOT HEAD AT LOCKS.

Lockport Light, Heat & Power Co. Mr. Ferry, Chief Operator.

Has two water wheels; old one 500 hp., new one 1,500 hp. Obtains water from the Hydraulic Race Co.

Old wheel uses about 149 sec.-ft. and new one about 325 sec.-ft. (information from C. E. Dickenson).

Grigg Brothers Flour Mill.

Has one 75-hp. wheel, four or five years old, and uses about 22 sec.-ft., or 68 hp.

Has a perpetual lease for 35 hp. (of water) and buys an additional 33 hp. from the Hydraulic Race Co.

Thompson Milling Co. Mr. Whitbeck, Manager.

Has one 650-hp. wheel, Holyoke Machine Co., Maker, installed about two years ago. Is using the following power:

Its own	98	horse-power.
Perpetual lease	78	horse-power.
Lease from Hydraulic Race Co.	294	horse-power.
Total	470	horse-power.

Trevor Manufacturing Co.

One 21-hp. wheel, using 20 hp., for which it has a perpetual lease.

Niagara Preserving Co. Now owned by Western Block Co.

Has one new wheel, rated at 135 hp. capacity, built by S. Morgan Smith Co. Not now operating.

Western Block Co.

Has one old 85-hp. wheel, using 75 hp. for which it pays rent to the Hydraulic Race Co.

(See also Niagara Preserving Co.)

Niagara Emery Co. Owned by the Franklin Mills Co. of Batavia, N. Y.

Has one old 120-hp. wheel, and owns 96 hp., for which it pays no rent. Is now using about 75 hp.

United Paper Board Co.

In its pulp mill at the canal, has two old wheels, rebuilt, at 1,200 = 2,400 hp. capacity. Is now using 250 sec.-ft.

This mill is supplied by the Hydraulic Race Co. (north tunnel) and has no connection with the 32-foot head noted below.

The Hydraulic Race Co. plans this spring to deepen the north tunnel to the bottom of the upper canal level and to build a hydro-electric plant just below the old locks.

NOTE.— All of the aforementioned plants are supplied by the Hydraulic Race Co. at a 50-foot head and are in no wise dependent on flow in Eighteen-Mile creek, because they merely by-pass water around Locks Nos. 34 and 35 and into the lower level of the Erie canal.

I. and T. Huston. Cold storage plant.

Have one 22-inch horizontal Leffel wheel, rated at 72 hp., about 10 years old. Are now using about 50 hp. with head of 18 to 20 feet.

Their right is to the waters of Eighteen-Mile creek, *i. e.*, about 3 square miles drainage area.

Notes on Power Installation

United Paper Board Co. U. M. Waite, Mill Manager.

Has 32-foot head at canal and 14-foot head below Clinton street. Former is not in use, but at latter there is an old wheel of 40 to 50 per cent efficiency. The grant from the Government of 500 sec.-ft. is revocable, as is also the lease with the State for carrying the same. The mill owners are seeking a 50-year lease, and as soon as a constant flow of 500 sec.-ft. is assured, this company plans to install at the canal for 1,400 hp., utilizing 32-foot head, at an estimated cost of $150,000. Mr. Waite thought they might install for an additional 500 sec.-ft. through the closed season of navigation, if such were granted.

Lockport Paper Co. Henry Nichols, Manager.

I did not see Mr. Nichols, but Mr. Gyatt states that this company is already equipped to use 500 sec.-ft. at a 12-foot head. The installation was new in 1918 and develops an efficiency of 85 to 88 per cent. About 4 feet additional head could be obtained if the company raised its spillway and acquired some adjacent flat land.

Has an auxiliary steam plant and also buys some power from the city.

Niagara Paper Co. Mr. Green at head.

Has two horizontal water wheels, 20 years old, with efficiency of perhaps 60 per cent. Also uses a steam plant and motors, aggregating about 555 hp.

Intends to install new plant when constant flow of 500 sec.-ft. is assured. Would probably install for an additional 500 sec.-ft. through the winter, if such flow were granted.

Westerman & Co. Calvin Sutliffe, Owner.

Have one 35-inch water turbine in use, about 1½ years old. Also have steam plant. Have no plans at present, but would install for 500 sec.-ft., when assured of same.

Would not install for additional 500 sec.-ft. in winter. Instead of hydro-electric plant, might connect water wheels direct with trains of rollers. Might consider combining head with Indurated Fibre Co. and Electric Smelting & Aluminum Co. for a common power plant.

Indurated Fibre Co. Mr. Bates, Manager, also President of Lockport Mill Owners Association.

31.4-foot head. Have three water wheels in use, a 17-inch Victor, a 32-inch McCormack and a 48-inch McCormack. One is direct connected, grinding pulp, one pumping water and one runs four beaters. 60 to 75 per cent efficiency.

Will put in new installation when constant flow of 500 sec.-ft. is obtained.

Would not install for additional 500 sec.-ft. in winter months. Would probably install its own individual plant.

Electric Smelting and Aluminum Co. Mr. Davis, Manager.

Now uses 30 to 40 hp. (one water wheel, about 50 per cent efficiency) and some electric power.

Has plans for installing two new units to generate 1,800 hp. at an estimated cost of $82,000, when assured of a constant flow of 500 sec.-ft. New installation guaranteed 88 per cent efficiency at 90 per cent load.

Would not install for additional 500 sec.-ft. in winter months, but desires same amount of water the year around.

Newfane Lumber & Mfg. Co. C. G. Evans, Operator

Has one 62-inch vertical turbine about 5 years old, Leffel make, 80 per cent efficiency. Capacity is 250 cubic feet per second. Output now averages 200 hp., 24 hours per day.

Fred Collins & Son. Mill at Newfane.

Have two turbines, both new. One is a 35-inch rated at 110 hp., and the other is 40-inch, rated at 47 hp. Takes 25 hp. to run feed side of mill and about 25 hp. to run wheat side. Use both.

Lockport Felt Co. Mr. Andrews, Engineer. Mill at Newfane.

Has two old vertical wheels, size not known. By rope drive run a 100-kilowatt generator, developing 110 kilowatts.

Western New York Water Co.

Have a power site at Burt, undeveloped.

STATE RIGHTS IN EIGHTEEN-MILE CREEK

The State has obtained certain rights to discharge waste waters from the canal into Eighteen-Mile creek. These rights were appropriated in 1834 and were for the amount wasted into the creek at that time, which, from the smallness of the canal and of the then water-supply, must, therefore, have been small. If it is decided to increase the flow to an amount materially above 375 second-feet without enlarging the channel, appropriations will be necessary for securing the right to flood the lands.

In the recent past there have been times when it was necessary to deliver more than 375 second-feet into Eighteen-Mile creek and in so doing property has been damaged and the owners have brought claims against the State therefor.

An estimate of the cost of carrying out the various improvements on Eighteen-Mile creek is given in the following table, No. 5.

Maps showing the conditions on Eighteen-Mile creek have been prepared, as follows:

Sheets 1, 2, 3 and 4, each entitled, "Map of Eighteen-Mile Creek, County of Niagara, N. Y., made by the State Engineer and Surveyor pursuant to the provisions of chapter 425, Laws of 1918. Examined and approved Feb. 19, 1919, R. G. Finch, Deputy State Engineer and Surveyor."

Sheet No. 5, entitled "Plan and Profile of Eighteen-Mile Creek," etc.

These maps show the location of the channel of the creek, various dams and mills, center line and general cross-sections of the proposed improvements, etc.

NOTE.— The maps accompanying this report may be found in a pocket at the back cover of this volume.

CONCLUSIONS

The investigations made by this Department warrant the following conclusions:

(1) That the present channel of Eighteen-Mile creek will carry a flow of 375 cubic feet per second without overflowing its banks.

(2) That to enlarge the channel of that creek to carry a flow of 500 second-feet without raising the water-surface above that for a flow of 375 second-feet is estimated to cost $31,855.00, and if the capacity of the stream is increased by flooding adjacent lands and making no excavation in the channel, the estimated cost will be $17,250.

(3) That to enlarge the channel of the creek by excavation, to carry a flow of 1,000 second-feet without raising the water-surface above that for a flow of 375 second-feet, is estimated to cost $211,945.00, and if the capacity of the stream is increased by flooding adjacent lands, and making no excavation in the channel, the estimated cost will be $52,957.50.

(4) That with a flow of 375 second-feet in the present channel the total water-power now in use is 2,070 horse-power and the undeveloped power 7,090 horse-power; *i. e.,* 77 per cent of the possible power on the stream is undeveloped.

(5) That if the channel of the stream is improved to carry a flow of 500 second-feet, the undeveloped power will be increased to 10,150 horse-power, or to five times the amount of power now used.

TABLE No. 1

Computations of Work to Be Done for Discharging 500 Second-feet, if Water-surface Is to Be Retained at Same Elevation as With Present Discharge of 375 Second-feet, Causing No Damage

RANGE No. (1)	Distance (2)	Excavation (3)	Excavation per linear foot (4)	Area needed for spoiling excavation (5)	Work to be done on present channel (6)	Flooded area, if present channel is to be retained (7)
	Feet	*Cu. yds.*	*Cu. yds.*	*Acres*		*Acres*
1.......						
	11,866	16,261	1.4	6.8	Deepen 1.0 foot.	55.9
14.......						
	3,266	1,089	0.3	1.5	Deepen 0.2 foot.	11.3
19.......						
	3,675	7,486	2.0	3.7	Widen 14 feet...	9.8
23.......						
	1,737	Clean out	Clean out	0.8	Clean out......	4.9
25.......						
	10,096	Clean out	Clean out	4.6	Clean out......	13.7
35.......						
Totals..........		24,836	....	17.4	....	95.6

DRAINAGE AREAS:

Olcott to junction with east branch...........	17 square miles.
East branch..............................	40 square miles.
Above junction with east branch.............	25 square miles.
Small branch above canal...................	3 square miles.
Total...............................	85 square miles.

TABLE No. 2

Computations of Work to Be Done for Discharging 1,000 Second-feet, if Water-surface Is to Be Retained at Same Elevation as With Present Discharge of 375 Second-feet, Causing No Damage

RANGE No. (1)	Distance (2)	Excavation (3)	Excavation per linear foot (4)	Area needed for spoiling excavation (5)	Work to be done on present channel (6)	Flooded area, if present channel is to be retained (7)
	Feet	*Cu. yds.*	*Cu. yds.*	*Acres*		*Acres*
1.......						
	11,866	65,043	5.5	13.3	Deepen 4.0 feet.	80.6
14.......						
	3,266	12,338	3.8	3.1	Deepen 2.0 feet.	17.2
19.......						
	3,675	46,686	12.7	13.7	Widen 88 feet...	26.4
23.......						
	1,737	6,369	3.7	8.0	Widen 31 feet...	6.8
25.......						
	10,096	86,751	8.6	27.3	Widen 57 feet...	64.4
35.......						
Totals	....	217,187	....	65.4	....	195.4
35.......						
	Present channel sufficient, if cleaned out..........................					100
55.......						
	Present channel sufficient..					12
R. W. & O. R. R. bridge..						
	Present channel sufficient..					....
Olcott....						
Total.	....					307.4

TABLE No. 3

Waste of Water-power at the Present Capacity of Stream (375 Second-feet)

PLANT	Present working head	Unde-veloped head	Total head claimed	Horse-power devel-oped at present	Available horse-power at 80 per cent efficiency	Available horse-power unde-veloped	Present installation
L. and T. Huston, United Paper Board Co.	19	13	32	50	1,090	1,040	22-in. wheel, 10 yrs old.
United Paper Board Co.	11.2	2.8	14	......	480	480	1 old wheel, 40 to 50% efficiency.
Lockport Paper Co.	11.2	0.9	12.1	380	410	30	For 550 hp.
Niagara Paper Co.	8.8	0.9	9.7	220	330	110	2 54-in. turbines, 20 yrs. old, 60% efficiency.
Westerman & Co.	19.4	1.1	20.5	180	700	520	1 35-in. turbine, 80% efficiency.
Indurated Fibre Co.	26	5.4	31.4	800	1,070	270	1 17-in. wheel; 1 32-in. wheel; 1 48-in. wheel; 60 to 75% efficiency.
Electric Smelting and Aluminum Co.	30.1	4.1	34.2	40	1,170	1,130	30-in. Victor wheel and 35-in. Victor wheel not in use; 2 small wheels in use.
Niagara Farmers Co.	0	5	5	0	170	170	None.
Horton Mills	0	9.5	9.5	0	320	320	Ruins.
Newfane Lumber and Manufacturing Co., and Fred Collins & Son	13.4	0.3	13.7	250	470	220	62-in. turbine; 5 yrs. old; 35-in. turbine, new; 40-in. turbine, new.
Lockport Felt Co.	7.3	1.6	8.9	150	300	150	2 old vertical wheels.
Western N. Y. Water Co.	0	47	47	0	1,600	1,600	None.
Totals	146.4	91.6	238.0	2,070	8,110	6,040	
Unclaimed power sites	......	30.9	30.9	......	1,050	1,050	
Totals	146.4	122.5	268.9	2,070	9,160	7,090	

SUMMARY — Total fall between lower level of canal and Lake Ontario .... 268.9 feet.
Total horse-power under 268.9 head (80% efficiency) .... 9,160 hp.
Horse-power developed .... 2,070 hp.
Horse-power undeveloped .... 7,090 hp.
Percentage wasted .... 77 per cent.

TABLE No. 4

Waste of Power at a Flow of 500 Second-feet

PLANT	Present working head	Unde-veloped head	Total head claimed	Horse-power devel-oped at present	Available horse-power at 80 per cent efficiency	Available horse-power unde-veloped	Present installation
L. and T. Huston, United Paper Board Co.	19	13	32	50	1,450	1,400	22-in wheel, 10 yrs. old.
United Paper Board Co.	11.2	2.8	14	0	640	640	1 old wheel, 40 to 50% efficiency.
Lockport Paper Co.	11.2	0.9	12.1	380	550	170	For 550 hp.
Niagara Paper Co.	8.8	0.9	9.7	220	440	220	2 24-in. turbines, 20 yrs. old, 60% efficiency.
Westermann & Co.	19.4	1.1	20.5	180	930	750	1 35-in. turbine, 80% efficiency.
Indurated Fibre Co.	26	5.4	31.4	800	1,430	630	1 17-in. wheel, 1 32-in. wheel, 1 48-in. wheel; 60 to75% efficiency.
Electric Smelting and Aluminum Co.	30.1	4.1	34.2	40	1,560	1,520	30-in. Victor wheel and 35-in. Victor wheel not in use; 2 small wheels in use.
Niagara Farmers Co.	0	5	5	0	230	230	None.
Horton Mills	0	9.5	9.5	0	430	430	Ruins.
Newfane Lumber and Manufacturing Co., and Fred Collins & Son	13.4	0.3	13.7	250	620	370	62-in. turbine, 5 yrs. old; 35-in. turbine, new; 40-in. turbine, new.
Lockport Felt Co.	7.3	1.6	8.9	150	400	250	2 old vertical wheels.
Western N. Y. Water Co.	0	47	47	0	2,140	2,140	None.
Totals	146.4	91.6	238.0	2,070	10,820	8,750	
Unclaimed power sites	......	30.9	30.9	......	1,400	1,400	
Totals	146.4	122.5	268.9	2,070	12,220	10,150	

SUMMARY — Total horse-power under 268.9-ft. head (at 80% efficiency) .... 12,220 hp.
Horse-power developed at present .... 2,070 hp.
Horse-power undeveloped .... 10,150 hp.
Percentage wasted .... 83 per cent.

TABLE No. 5

Estimates of Cost of Enlarging Eighteen-Mile Creek to Carry Flows of 500 to 1,000 Cubic Feet per Second

1.— Estimate of cost to put creek in condition to carry 500 second-feet.

(*A*) *By excavating channel.*

25,000 cu. yds. of excavation @ $1.00	$25,000
18 acres of land for spoil-banks @ $150	2,700
Engineering and contingencies, 15 per cent	4,155
Total	$31,855

(*B*) *Cost if land is flooded. No excavation.*

100 acres of land flooded @ $150	$15,000
Engineering and expenses, 15 per cent	2,250
Total	$17,250

2.— Estimate of cost to put creek in condition to carry 1,000 second-feet.

(*A*) *By excavating channel.*

218,000 cu. yds. of excavation @ $.80	$174,400
66 acres of land for spoil banks @ $150	9,900
Engineering and contingencies, 15 per cent	27,645
Total	$211,945

(*B*) *Cost if land is flooded. No excavation.*

307 acres of land flooded @ $150	$46,050 00
Engineering and expenses, 15 per cent	6,907 50
Total	$52,957 50

BOUNDARY LINE REPORTS

SURVEYING AND MONUMENTING PART OF THE DELAWARE-SCHOHARIE COUNTY LINE

SURVEYING AND MONUMENTING THE WARRENSBURG-LUZERNE TOWN LINE AND THE WARREN-SARATOGA COUNTY LINE

SURVEYING AND MONUMENTING PART OF THE ULSTER-GREENE COUNTY LINE

SURVEYING AND MONUMENTING PART OF THE CAYUGA-WAYNE COUNTY LINE

EXAMINATION OF THE NEW YORK-NEW JERSEY STATE LINE MONUMENTS

DELAWARE-SCHOHARIE COUNTY BOUNDARY LINE

State Engineer's Report on the Survey of a Portion of the Boundary Line Between the Counties of Delaware and Schoharie

(Chapter 559, Laws of 1918, Section 1)

The following is the report of the field work done by and under the direction of the State Engineer and Surveyor in locating, establishing and permanently marking upon the ground a portion of the boundary line between the counties of Delaware and Schoharie.

Chapter 559, Laws of 1918, section 1, reads in part as follows: "The State Engineer and Surveyor is hereby authorized and directed to locate, establish and permanently mark upon the ground the county boundary line between the towns of Gilboa and Jefferson, Schoharie county, and the towns of Roxbury, Stamford and Harpersfield, Delaware county, from a point where the counties of Greene, Delaware and Schoharie meet at Utsayantha lake."

In 1914 a survey of the county line between Greene and Schoharie counties was made in accordance with chapter 760, Laws of 1913. In the report of this survey, in Vol. I of the State Engineer and Surveyor's report for the fiscal year ended September 30, 1914, there is a description of the line which is now the defined line between Delaware and Schoharie counties between the points mentioned in the act under which the present survey was made. This description states "that by chapter 63, Laws of 1788, of the Senate and Assembly of the State of New York, the counties of Albany and Ulster were formed and a portion of the boundary line between them was established as follows: '. . . and running thence to the head of Kaaters creek or kill, where the same issues out of the southerly side or end of a certain lake or pond lying in the Blue mountains; then from thence to a small lake called Utsayantho, and thence north . . ' By chapter 42, Laws of 1795, Schoharie county was erected from the counties of Albany and Otsego and a portion of the dividing line between Albany and Schoharie coun-

NOTE.— The map accompanying this report may be found in a pocket at the back cover of this volume.

ties was defined as follows: '. . . . beginning at the northwest corner of the manor of Rensselaer and running thence southerly along the westerly line thereof, to the southwest cornor of said manor thence westerly on a direct line to the place where the Ulster county line crosses the Schoharie creek thence along the said line to Lake Utsayantho . . .' By chapter 59, Laws of 1800, Greene county was erected from the counties of Albany and Ulster. By chapter 123, Laws of 1801, 'the extent and limits' of the thirty counties of New York state were defined. The boundary line of Greene county is defined in part as follows: '. . . to the southwest corner of the manor of Rensselaerwyck, and a line drawn from thence to the place where the line formerly run from the head of Kaaters creek issuing out of the southerly side or end of a certain lake or pond, lying in the Blue mountains, to a small lake called Utsayantho intersects the Schoharie creek, and westerly by the said county of Delaware.' By the same act the boundary of Schoharie county is defined in part as follows: '. . . along the north bounds of Harpersfield to the said Lake Utsayantho and southerly by a line formerly run from the head of Kaaters creek, where the same issues out of the southerly side or end of a certain lake or pond, lying in the Blue mountains to the said Lake Utsayantho, and by part of the north bounds of the county of Greene.'"

In the act of 1801, in addition to that portion quoted above, it is stated that the boundary of Delaware county is defined in parts as follows: ". . . . and along the southerly bounds of the county of Schoharie to the Lake Utsayantho."

By the survey of 1914 the point on the line between "the end of a certain lake or pond in the Blue mountains" and "the Lake Utsayantho" and in the center of the Schoharie creek was established. By chapter 559, Laws of 1918, under which this present survey was to be made, this point, which is the point where Delaware, Greene and Schoharie counties meet, was designated as the eastern end of the survey. A straight line from this point to Lake Utsayantho is a portion of the line defined in the act of 1801 and is a line forming a boundary between Delaware and Schoharie counties. As to the exact location of the western end of the line at Lake Utsayantho, nothing was found in laws or records to indicate just what point in the lake should be taken. An old map was found in the State Library which showed that in 1787 a line was run

from Kaaters creek in the direction of Lake Utsayantho, but this line struck north of the lake. A line was then evidently run from Lake Utsayantho in the direction of Kaaters creek, but this line struck south of the head of the creek. A line was shown on the map as connecting the southern side of the lake with the head of Kaaters creek, but was evidently not run out. After an extensive study of the laws affecting this line and of the lake itself, it was decided that it was evidently meant that the outlet of the lake, as in the case of "the lake or pond in the Blue mountains," was the point to be taken.

The survey pursuant to chapter 559, Laws of 1918, was made by running a random line approximately along the county line from the spillway of Lake Utsayantho to the point at the center of Schoharie creek (as defined above) and then the bearing of the straight line between these points was computed and found to be S 62° 12′ E. Having established the bearing, the county line was then, by proper surveying methods, established on the ground and monuments were placed as follows:

Monument I is on the south side of Lake Utsayantho at the approximate angle in the county line and is 322.7 feet N 62° 12′ W from center of lake spillway. It is 22.5 feet from a blazed pine tree and 9.6 feet from a blazed maple tree.

Monument II is on a hill southeast of the lake, 3,722.7 feet from Monument I. It is 394 feet northeast of a blazed double oak tree and 210.8 feet southeast of a 14-inch blazed oak tree.

Monument III is on the same hill, 1,000.0 feet from Monument II and about 1/4 mile northwest of the "Murphy" house. It is 3 feet west of a stone wall, 80.4 feet northwest of a blazed maple tree and 104.5 feet northeast of another blazed maple tree.

Monument IV is 5,756.4 feet from Monument III and is north of the guard-rail on the State highway from Stamford to Grand Gorge, about 1 1/2 miles from Stamford. It is 10.7 feet southwest of a blazed elm tree and 19.4 feet southeast of a blazed cherry tree.

Monument V is 2,523.6 feet from Monument IV and west of a woods. It is 5 feet west of a stone wall, 5.7 feet northwest of a blazed cherry tree and 35.9 feet north of a blazed beech tree.

Monument VI is 5,620.1 feet from Monument V and is located on a hill. It is 142.6 feet from a blazed maple tree and 90.5 feet northwest of blazed double maple trees.

Monument VII is on a hill 2,970.0 feet from Monument VI. It is about 1/4 mile northwest of Patrick Moore's house, and 90.9 feet northeast and 115.8 feet northwest, respectively, of blazed maple trees.

Monument VIII is 1,509.5 feet from Monument VII and north of the highway from Stamford to Grand Gorge. It is S 62° 12′ E of Patrick Moore's house and 75.8 feet southwest of a blazed maple tree and 62.2 feet northwest of the northeast corner of the parapet wall of a small highway bridge.

Monument IX is on a hill and is 5,820.5 feet from Monument VIII. It is 452.7 feet southeast of a blazed hickory tree and 284.7 feet from a blazed pine tree.

Monument X is 6,366.2 feet from Monument IX and east of a roadway. It is 90.7 feet east of the corner of Cattone Brothers house and 92.0 feet northwest of the corner of another house.

Monument XI is 4,363.8 feet from Monument X and is located on a hill. It is 7.0 feet southwest of a blazed birch tree and 122.0 feet northwest of a blazed triple chestnue tree.

Monument XII is on the west side of the Grand Gorge–Gilboa highway and is 4,017.0 feet from Monument XI. It is 318.6 feet southwest of a blazed chestnut tree and 215.3 feet northwest of a blazed chestnut tree.

Monument XIII is on a high rock ledge of Pine mountain and is 2,039.2 feet from Monument XII. It is 106.7 feet southwest and 122.6 feet northwest, respectively, of blazed oak trees.

Monument XIV is in the woods on Pine mountain, 4,433.8 feet from Monument XIII and 3,628.8 feet from the center of Schoharie creek, the point referred to early in this report. It is about 5 feet west of a wire fence, 17.0 feet southeast of a blazed birch and 44.8 feet north of a hole drilled in a large rock.

All the monuments were made of concrete. Monuments I, III, IV, VIII, X and XII were about six inches square and thirty inches long with a bronze plug in the top of each. These monuments were set in a concrete base that extended about three feet below the surface of the ground. The remaining monuments were cast in place, a piece of stovepipe being used for the form above the ground, and a piece of heavy copper wire being used for the point in the top. All monuments were reinforced.

A report of the field work done in locating, establishing and permanently marking this line upon the ground, a map showing the location, establishment and permanent marking, together with all field-notes, maps and data obtained, have been filed in the office of the State Engineer and Surveyor, and true copies of the completed report and map have been filed in the office of the State Comptroller and in each of the County Clerks' offices of the counties of Delaware and Schoharie.

(Signed) FRANK M. WILLIAMS,
State Engineer and Surveyor.

WARRENSBURG–LUZERNE TOWN AND WARREN–SARATOGA COUNTY BOUNDARY LINES

State Engineer's Report on the Survey of the Warrensburg-Luzerne Town Boundary Line, Warren County, and the Warren-Saratoga County Boundary Line

(Chapter 561, Laws of 1918)

The following is the report of the work done by and under the direction of the State Engineer and Surveyor in establishing the boundary line between the town of Warrensburg and the town of Luzerne, and the line between Warren county and Saratoga county, from the Hudson river westerly to the easterly line of Hamilton county.

Chapter 561, Laws of 1918, reads in part as follows: "The State Engineer and Surveyor is hereby authorized and directed to locate, establish and permanently mark upon the ground the line between the town of Warrensburg and the town of Luzerne, in Warren county, and the line between Warren county and Saratoga county, from the Hudson river westerly to the easterly line of Hamilton county."

After an extensive search had been made and a complete report received from Deputy Attorney-General Burton H. Loucks, representing the Conservation Commission, the history of the line to be surveyed was available for the use of the State Engineer's Department and the field work was begun during the month of June, 1918. The search and report referred to showed as follows:

" The towns of Luzerne and Warrensburg lie along the east side of the Hudson river and the division line between them is apparently an easterly continuation of the Warren–Saratoga county line referred to above. The legislative acts affecting this line are as follows:

" March 12, 1772, the Colony passed chapter 1534, entitled 'An Act to divide the county of Albany into three counties . '. . Be it enacted by his Excellency the Governor and Counsel and the

NOTE.— The map accompanying this report may be found in a pocket at the back cover of this volume.

general assembly, and it is hereby enacted by the authority of the same, that the county of Albany shall be henceforth restricted to the bounds and limits following, to wit: On the south, and on the west side of Hudson river by the county of Ulster . . . to the Mohawk river, thence north until it intersects a west line drawn from Fort George near Lake George, thence east until it intersects a north line drawn from that high falls on Hudson river next above Fort Edward . . . and be it enacted by the same authority, that all the lands lying within this colony to the westward of the county of Albany as by this Act restricted, and to the westward of the north line drawn from the Mohawk river, above mentioned, continued to the north bounds of this province, shall be one separate and distinct county and be called and known by the name of the county of Tryon. And be it enacted by the same authority, that all the lands lying within this colony to the northward of the county of Albany as restricted by this Act, and to the eastward of the county of Tryon and to the westward and northward of the counties of Cumberland and Gloucester shall be one separate and distinct county, and be called and known by the name of the county of Charlotte.'

"March 8, 1773, there was passed chapter 627, entitled, 'An Act to run out the division between the counties of Albany, Tryon and Charlotte . . .'"

On file in the State Engineer's office are manuscript notes, map and survey of Jessup's Upper Patent in 1772. The northerly and southerly bounds are shown as running due east from the Hudson river. The northerly boundary of the tract, some four miles long, is in the immediate vicinity of the Warrensburg and Luzerne town line, and was actually run out with compass the same year the west line from Fort George was established by legislative enactment. There are also on file in the State Engineer's office notes of a survey of the north line of Saratoga county from Hudson river west, by Seth C. Baldwin, dated September 12, 1798. The bearing of this line is here given as S 88° W. Distances from the Hudson river to various streams, mountains and valleys are given, but these apparently have no relation to map No. 386, noted above.

On the first of April, 1775, the assembly of the province passed chapter 1719, "An Act to alter part of the line that divides the counties of Albany, Charlotte and Cumberland." This act trans-

ferred the land east of Hudson river and south of the Fort George west line from the county of Albany to that of Charlotte. On the 2nd of April, 1775, the name of Charlotte county was changed to Washington and that of Tryon to Montgomery.

On the 7th of February, 1791, the legislature divided Albany county into two parts, the northerly portion taking the name of Saratoga county.

On the 10th of April, 1792, an act was passed, chapter 59, erecting the town of Fairfield with the Hudson river as west bounds, and north bounds, the west line from Fort George. On the same date the town of Thurman was described in part as " beginning at a creek called McAuley's near the south end of Lake George and running thence on a direct line to the northeast corner of Fairfield; thence west along the north line thereof to the River Hudson, thence along the north bounds of Saratoga county to the east line of Herkimer county, thence along the east line of Herkimer county to Clinton county."

On April 6, 1808, by act of Legislature the name of Fairfield was changed to Luzerne. On March 26, 1813, by act of Legislature Washington county was divided, that portion containing Luzerne and Thurman taking the name of Warren.

On the 12th of February, 1813, by legislative act that portion of the town of Thurman lying east of the Hudson river and north of Luzerne was to be called Warrensburg, the remaining portion taking the name of Athol.

By the revised statutes of 1830, chapter 2, Title 1, this State was divided into 56 counties, the boundaries of which are accurately given, the boundaries for Warren and Saratoga being the same as in previous laws. Section 3 of this act reads as follows: "All lines, which in the foregoing bounds, are described as courses indicated by the magnetic needle, are respectively to be taken as the magnetic needle pointed at the several times when such lines were originally established."

In this same act the bounds of the several towns are given, that for Luzerne being ". . . on the north by an easterly continuation of the north bounds of Saratoga county . . ."

From an examination of the foregoing data it is seen that the problem in hand was to locate on the ground the ancient west

line from Fort George either by finding and identifying marks or monuments set by some previous and authorized survey or, failing this, to run in a line from Fort George in accordance with the magnetic declination of 1772.

Available reliable records of magnetic declination in the vicinity of the line extended back only as far as the year 1882. Hence in order to ascertain the approximate probable declination of the needle at Fort George at the time this line was established by statute, recourse was had to a long series of observations made at Albany. The 1905 report of the United States Coast and Geodetic Survey gives the declination at Albany in the years 1772 and 1905 as 6 degrees 11 minutes west and 11 degrees and 6 minutes west, respectively, or a change of 4 degrees 55 minutes in the 133-year interval. The same report gives the declination at Lake George near Fort George in 1905 as 11 degrees 55 minutes west. On the assumption that the total change during the 133-year period was the same in amount and direction at Lake George as at Albany, a value of 7 degrees 0 minutes west is found as the approximate declination at Fort George in the year 1772.

A portion of the original Fort George, the starting point of the ancient west line, is still in existence, having been taken over as a reservation by the State. Construction of the fort was begun early in 1759, by forces under Gen. Amherst as a base for operations against Fort Ticonderoga and Crown Point. As laid out it was to have been some 500 feet square with a bastion at each corner, the ramparts 12 to 18 feet thick, of carefully laid masonry backfilled with earth and the whole protected by an outer series of breastworks and rifle pits. The campaign to the north having been successful, there was no further need for the fort and work was suspended before December of the same year, a portion of the rifle pits and the southwest bastion having been completed. (See *Life of Gen. Amherst*; also *Set of Plans and Forts in America*, by Roque; and *Memoirs upon the Late War between the French and English*, by M. Pouchot.)

Working westward along a line with a true bearing of S 83° W from Fort George, inquiry and search was made for marks or other evidence that might lead to the identification of some point on the true line. The first point of any importance was a very

old blue beech tree with two sets of marks, one set probably eight or ten years old, the other nearly grown over. This tree stands on the west bank of the Hudson river about one and one-third miles below the Stony Creek railroad station. It has been used by local surveyors and generally accepted by the residents round about as being on the division line between the counties of Warren and Saratoga. About a mile farther west, on Hadley Hill at a three-way road junction, a reputed and accepted division point was found where the road work of the towns of Hadley and Stony Creek met. Half a mile west of this there was a property line fence reputed to be on the county line and so recorded in various deeds. About four miles to the west of the Hudson river the line was reputed to lie in the saddle between two mountains, called Round Top and West. Five miles from the river a property line fence according to tradition and deed was on the county line. At little farther on the charred stump of a huge hemlock tree was found. A local resident claimed that before the fire of a few years previous it was plainly marked and was generally accepted as property and county line. About eight miles to the west of the river and on the road leading into Livingston lake there are two marked trees. West of Livingston lake for some distance there are two county lines used, one possibly half a mile north of the other. From here to the Hamilton county line a brief reconnaisance showed more marked trees, and it was evident that the line through these points was far from straight.

The line runs through the rough and wild country forming the Adirondacks. About 75 per cent of its length is through a dense and heavy hardwood forest and with the exception of a few small stretches it is sparsely settled. Owing to the character of the country, it was decided that the most feasible method of determining the relation of the various marks reputed to be on this line, both to each other and to the line from Fort George, was to make the survey by triangulation. Consequently, on June 18, 1918, field work was begun at Lake George. A base line was staked out and its length and true astronomical bearing determined. As the starting point of the whole survey the center of the one completed (southwest) bastion was taken and a connecting random line was run from the base line. A series of triangulation stations

were established on mountain tops from one to two miles apart and as near as practicable to the probable location of the final line. Another series of stations was placed somewhat to the north, angles between the two observed and computations made, working always toward the west. By the second week in August a base line had been established along the Hudson river and the work checked as to distance and bearing.

From a study of the data secured it was found:

That a line drawn through these various points would be very crooked;

That an average line drawn through them would strike considerably north of Fort George;

That the bearing from Fort George to any of these points fell between the extremes of S 82° 18′ W and S 82° 38′ W;

That the bearing from Fort George to the blue beech, previously mentioned, on the west bank of the river and undoubtedly the most reliable of all the markers was S 82° 38′ 20″ W;

That the bearing of the north line of Great Lot No. 2, Jessup Patent, was S 82° 41′ W.

The north boundary of Jessup's Patent was run out in the field in 1772, the date of passage of the act establishing the "Fort George west line." The north line of Great Lot No. 2 is parallel to the north boundary of the Patent and runs from the river easterly some five or more miles nearly parallel to and about 600 feet north of the Fort George–blue beech line. The difference in bearing of these lines, as will be noted, is some three minutes, much less than might be reasonably be expected.

Thus it is seen from the data that the blue beech tree meets the requirements of a generally accepted monument and that it is further checked as having the correct bearing from Fort George as determined by the best available data. The work of monumenting this line, as thus established, was begun at the Hudson river and carried easterly about five miles. Triangulation stations on both sides of the Hudson were permanently marked and tied in for future use. On September 23, 1918, field work was suspended for lack of funds.

Monuments were set as follows and because of the densely wooded country they were well tied in:

Monument No. 1. On the east bank of the Hudson river and west of the highway; a cast-in-place concrete marker 5.2 feet long set 4.2 feet in the ground, 6 inches square at top and 8 inches square at ground-surface, marked on the south, "L", on the north, "W", centered with ¾-inch galvanized-iron pipe projecting 3 inches. The northwest corner of Eddy's barn is due south 147 feet; a marked twin pine, N 20° W, 20 feet; a marked twin pine, S 45° W, 38 feet; and a marked four-inch pine, N 85° W, 12 feet (on town line).

Monument No. 2. A 3/16-inch brass bolt, screw head, set in highest point of ledge at summit of ridge and 12,970 feet east of Monument No. 1. A marked 10-inch maple is S 67° E, 19.7 feet; a marked 6-inch oak, N 47° W, 4.2 feet; and a marked 15-inch pine, S 14° E, 26.3 feet.

A cutting was made on the town line entirely across the top of the ridge.

Monument No. 3. A 3/16-inch brass bolt, screw head, set in ledge rock, about 4 feet above and 12 feet to west of center of road leading along west side of Stewart brook and 16,882 feet east of Monument No. 1. The southwest corner of a cellar hole is S 85° 15′ E, 106 feet; the northwest corner of a barn, S 0° 45′ W, 176 feet; a marked 8-inch elm, S 11° 30′ E, 124 feet; a marked 8-inch maple, S 6° 15′ E, 101 feet; a marked 6-inch butternut, S 27° 0′ W, 15 feet; and a marked 3-inch elm, N 82° 30′ W, 26 feet.

Monument No. 4. 18,869 feet east of Monument No. 1; a cast-in-place concrete marker 3 feet long set on rock (2 feet under ground-surface), 4 inches square at top, 6 inches square at surface of ground and centered with a ¾-inch galvanized-iron pipe projecting 3 inches. Not tied in, but signal tripod 10 feet high left in place over monument.

Monument No. 5. 25,997 feet east of Monument No. 1; a 3/16-inch brass bolt set in top of large rock. A 10-inch beech is S 83° 30′ W, 13.5 feet; a 6-inch beech, N 18° 0′ W, 20.9 feet; and a 5-inch maple, N 42° 0′ E, 6.0 feet.

Monument No. 6. 26,212 feet east of Monument No. 1; a 24-inch hemlock tree, with "W" and "L" cut about breast high in north and south sides, respectively.

The line was also cut across ridge about 6,000 feet to east of Monument No. 1.

Using "Map of Lots 1 to 5 Jessup 7755A Patent from Survey by I. C. Wood, Chief Land Surveyor" (Conservation Commission) dated May, 1912, as a means of identification, and from actual measurements made in the field, it is found that the north line of Great Lot No. 2 is 609 feet and 613 feet north of Monument No. 1 and Monument No. 3, respectively.

It is recommended that additional funds be provided at an early date in order that the work already done may be conserved.

A report of the field work done in locating, establishing and permanently marking this line upon the ground, as above described, a map showing the location, establishment and permanent markings, together with all field-notes, maps and data obtained, so far as the work has been completed, have been filed in the office of the State Engineer and Surveyor, and true copies of this report and map have been filed in the office of the State Comptroller and in each of the County Clerks' offices of the counties of Warren and Saratoga, State of New York.

(Signed) FRANK M. WILLIAMS,
State Engineer and Surveyor.

ULSTER-GREENE COUNTY BOUNDARY LINE

State Engineer's Report on the Survey of Part of the Boundary Line Between the Counties of Ulster and Greene

(Chapter 562, Laws of 1918, Section 1)

The following is the report of the work done by and under the direction of the State Engineer and Surveyor in locating, establishing and permanently marking upon the ground a portion of the boundary line between the counties of Ulster and Greene, as performed during the years 1918 and 1919.

This survey was authorized by chapter 562, Laws of 1918, section 1, which reads in part as follows: "The State Engineer and Surveyor is hereby authorized and directed to locate, establish and permanently mark upon the ground a portion of the north boundary line of the county of Ulster and being a portion of the south boundary line of the county of Greene and known as the north boundary line of Great Lot number eight, Hardenburgh Patent."

The survey was started in August, 1918, and continued until December 13, 1918, when work was closed for the winter. By chapter 600, Laws of 1919, an additional appropriation was made and the work carried to completion.

By chapter 59, Laws of 1800, Greene county was erected from the counties of Albany and Ulster. By chapter 123, Laws of 1801, "the extent and limits" of the thirty counties of New York state were defined. Chapter 46, Laws of 1812, states: "That from and after the passing of this Act, the division line between the counties of Ulster and Greene shall begin at the point where the division line between the counties of Ulster and Delaware intersects the line run for the north-easterly bounds of Great Lot number eight, in the Hardenburgh Patent, then southeasterly along the said line until it intersects the line run by Jacob Tremborn, Junior, in the year one-thousand eight hundred and eleven for the division between the counties of Ulster and Greene, thence along the last mentioned line . . . ."

NOTE.— The map accompanying this report may be found in a pocket at the back cover of this volume.

This law and also chapter 562, Laws of 1918, states that the boundary line is a portion of the north boundary line of Great Lot number eight, Hardenburgh Patent.

The partition deed of November 14, 1749, Liber 14, page 538, Office of the Secretary of State, describes lot number eight as follows: "Lot number eight bounded southerly by lot number seven, northerly by a line to be drawn from monument number fourteen on the said branch (East branch of Delaware river) to monument number four on the east of the patent, being a heap of stones around a red Oak tree N. 4 standing forty chains to the southward of Cornelius Van Keuren's house and thirty chains to the southward of the Sawkill."

The records in the County Clerks' offices of Delaware and Ulster were searched for information concerning monuments fourteen and four. Records were found deeding property from these monuments. An old map was found in the State Library which showed monument four and its position in relation to the Sawkill and Cornelius Van Keuren's home. An old map was also found in the possession of Sheldon Vreddenburgh of Zena, N. Y., which also showed monument four and its connection with his property. With the above information a portion of the property near monument four was run out and the position of the monument located on the ground. This position was also checked in relation to the Sawkill and the VanKeuren house. As all these methods located the monument in approximately the same place, there was no doubt but that the correct position of the monument had been found.

The position of monument fourteen was not so difficult to find, as old stone walls that were property lines were easily found and these pointed to the position of the old monument on the river bank. An old dead stump about fifteen feet high and four feet in diameter, which showed many old blazes, was found standing in the west wall. On the river bank a number of large stones were found and some small trees were growing up among the stones.

This survey was made by running a random line from monument fourteen to monument four. The line was first put through from mountain top to mountain top. The length of the line from the three-county point to the Ox Clove was determined by chaining;

for the remainder of the distance, stadia was used. The total distance of line run was about twenty-nine miles. After the length of the line had been determined, a straight line was computed from monument four to monument fourteen, and the true bearing of this line was found to be N 62° 48′ W. Having established the bearing of the county line, the line was thus established on the ground and monuments were placed, as follows:

Monument I is at the approximate corner of the towns of Lexington and Hunter, Greene county, and the town of Shandaken Ulster county. It is on the west side of a road in a private park about 0.6 mile north of Chichester. It is about 57.3 feet from the north edge and 58.9 feet from the south edge of a small summer house with artistic water-wheel, and about 70 feet west of Ox Clove creek.

Monument II is near the edge of a woods, 587 feet from Monument I. It is 64.0 feet north of a 10-inch bass wood tree, 55.5 feet east of a 10-inch basswood tree and 25.3 feet south of a 12-inch twin apple tree.

Monument III is on a mountain, 5,062.4 feet from Monument II. It is 16.0 feet northeast of a 20-inch maple tree, 16.2 feet northwest of a 7-inch beech tree and 3.8 feet northeast of a 12-inch ash tree.

Monument IV is 6,954.0 feet from Monument III, east of Forest Valley highway and about 100 feet south of Bridget Ennist's house. It is 42.9 feet northeast of a 8-inch locust tree, 31.3 feet south of a 7-inch locust tree and 23.6 feet southwest of a 10-inch locust tree.

Monument V is 6,508.9 feet from Monument IV, east of Peck Hollow road and about 200 feet south of Herbert Yotes' house. It is 21.2 feet northeast of a 3-inch maple tree, 25.8 feet southeast of a 4-inch maple tree and 24.9 feet north of a twin apple tree.

Monument VI is on a mountain, 5,953.7 feet from Monument V. It is 11.6 feet north of a 4-inch maple tree, 2.7 feet southeast of a 8-inch maple tree and 8.6 feet southwest of a 4-inch maple tree.

Monument VII is in Bushnellsville, 7,389.2 feet from Monument VI, west of Bushnellsville–West Kill highway and north of Bushnellsville creek. It is 90.7 feet northeast of the northeast

corner of Andrew White's barn, 60.8 feet southwest of a 8-inch maple tree and 61.8 feet northwest of the northwest corner of a bridge over Bushnellsville creek.

Monument VIII is 8,329.6 feet from Monument VII, east of highway, and about 2,000 feet north of Wm. Redmond's house. It is 51.8 feet southeast of a 5-inch apple tree, 35.8 feet east of a 10-inch apple tree and 31.3 feet northeast of a 12-inch apple tree.

Monument IX is on a mountain, 3,174.1 feet from Monument VIII and is near the intersection of the counties of Ulster, Greene and Delaware. It is 50.1 feet southeast of a 15-inch maple tree, 60.6 feet west of a 24-inch birch tree and 78.5 feet northeast of a 18-inch oak.

All the monuments were made of concrete. Monuments I, II, IV, V, VII, VIII and IX are about 4½ inches square at the top, 5½ inches at the bottom, and three feet long, with a copper wire point in the top of each. These monuments were set in a concrete base that extended about three feet below the surface of the ground.

The remaining monuments were cast in place, a piece of stovepipe being used for the form above the ground and a piece of copper wire being used for the point in the top of these monuments. All monuments were reinforced with iron rods.

It should be noted that Monument I does not indicate the point where that line which, extending northeasterly, forms the boundary line between Ulster and Greene counties intersects the line established, for the funds were not sufficient to trace out that line, but said line would intersect the established line at or near Monument I.

A report of the field work done in locating, establishing and permanently marking this line upon the ground, a map showing the location, establishment and permanent markings, together with all field-notes, maps and data obtained, have been filed in the office of the State Engineer and Surveyor, and true copies of the completed report and map have been filed in the office of the State Comptroller and in the County Clerks' offices in the counties of Ulster and Greene.

(Signed) FRANK M. WILLIAMS,
State Engineer and Surveyor.

CAYUGA-WAYNE COUNTY BOUNDARY LINE

State Engineer's Report on the Survey of a Portion of Boundary Line between the Counties of Cayuga and Wayne

(Chapter 484, Laws of 1919)

The following is the report of the field work done by and under the direction of the State Engineer and Surveyor in locating, establishing and permanently marking upon the ground the line between the town of Conquest in the county of Cayuga and the town of Savannah in the county of Wayne, as performed during the summer of 1919.

The basis of the survey consisted of two approved marks, one a stone monument at the northerly end of the County Line road and on the northerly side of the easterly and westerly road leading to Spring lake, the other a 12-inch cedar post set in a pile of stones and known as the "Hiram Sibley corner." These two marks are approved and have been used by local surveyors for many years.

The line was run through these two marks south to the center of the Seneca river, thence down the center of the Seneca river to the "South channel," the center of which is the southerly line of the town of Conquest and the northerly line of the town of Mentz, both in Cayuga county. The line was produced northerly to the easterly and westerly line between the town of Butler and town of Savannah, both in Wayne county. This line produced northerly passed through large trees which are to the north on this line and in general satisfied all conditions in the field.

Many authoritative records and maps were consulted and after giving due consideration to all available data the line was established and marked as shown on the accompanying map, entitled, "Boundary Line between the Towns of Conquest, Cayuga Connty, and Savannah, Wayne County. Survey and map made by the Department of the State Engineer and Surveyor, as authorized by Chapter 484, Laws of 1919."

NOTE.— The map accompanying this report may be found in a pocket at the back cover of this volume.

Ties and the permanent monuments were set as shown on the map. All bearings refer to the true north, which was established by observation on Polaris, made on September 24, 1919.

The field-notes showing information in connection with the field work of making the survey are filed in the office of the State Engineer and Surveyor, Albany, New York.

This report is filed in the office of the Comptroller of the State of New York, in the office of the State Engineer and Surveyor and in the offices of the County Clerks and County Treasurers of the counties of Cayuga and Wayne, as required by chapter 484, Laws of 1919.

(Signed) FRANK M. WILLIAMS,
State Engineer and Surveyor.

NEW YORK–NEW JERSEY BOUNDARY LINE EXAMINATION

Joint Report of the Engineers on the Examination of the Monuments Marking the Boundary Lines Between the States of New York and New Jersey, Made in May, 1919

The undersigned engineers, designated by the State Engineer and Surveyor of New York and the New Jersey State Board of Commerce and Navigation to make an examination of the monuments marking the boundary lines between the states of New York and New Jersey, have the honor to submit this report and detailed description of the monuments.

Classification of Monuments

In Raritan Bay

The monuments marking that part of the New York and New Jersey boundary line lying across lands under water in Raritan bay consist of the Romer beacon or lighthouse, the Permanent monument, the Great Beds lighthouse and the Morgan Range beacon. (See photographs.)

In Arthur Kill and Kill von Kull

The range monuments marking that part of the New York and New Jersey boundary line lying across lands under water in Arthur kill and the Kill von Kull are of granite, four feet long, having the tops dressed eight inches by eight inches in cross-section and for a distance down of about eight inches. On the north face generally of each are cut the letters " N. Y." and " N. J." and on the south, or opposite face, the letters " B. M." (meaning " Boundary Monument ") and the figures " 1889." One-quarter-inch grooves are cut at right angles across the top parallel with the sides, one groove entirely across the top and other other only partially across. They project about four to eight inches above ground.

Between Hudson and Delaware Rivers

The monuments marking that part of the New York and New Jersey boundary line extending from the Hudson river to the Delaware river may be divided into five classes and consist, first, of the original mile monuments erected in 1774; second, the new mile monuments; third, the railroad monuments; fourth, the wagon road monuments; and fifth, the terminal and witness monuments, all of which were set by the Joint Commission in 1882, except the original monuments of 1774, which were reset, when necessary, by said Commission at said time.

The monuments of the first class, the original mile monuments, are composed for the greater part of red sandstone posts, dressed with eastern and western upper angles rounded and are generally fifteen inches wide in the direction of the boundary, seven inches thick and project above ground about twenty inches. The remainder are of rough, irregularly shaped rock of different material, all having the name of the State cut on the appropriate side of the stone and also the number of the mile distant from the eastern terminus of the line.

The monuments of the second class, the new mile monuments, are of granite, four feet long, the tops dressed generally six inches by six inches in cross-section and for a distance down of six inches. Upon the north side are cut the letters " N. Y." and on the south side the letters " N. J." and upon the east side the number corresponding to the number of miles distant from the eastern terminus of the line. One-quarter-inch grooves are cut at right angles across the top parallel to the sides; one groove shows the direction of the boundary and the other is perpendicular to it. They project above ground generally about six inches. They are set east of and generally adjacent to the old mile stones.

The monuments of the third class, the railroad monuments, are generally similar to the mile monuments, except that they are not marked with numbers.

The monuments of the fourth class, the wagon road monuments, are of granite and are four and one-half feet long; the tops are dressed six inches by twelve inches in cross-section and for a distance down of twelve inches. They are marked in the same manner as the railroad monuments and project generally about twelve inches above the ground.

The monuments of the fifth class, the terminal and witness monuments, are as follows, viz.:

The monument at the eastern terminus is a large block of trap-rock, seven feet six inches long, three feet two inches high and about four feet thick. It is located at the foot of the Palisades and about six inches above storm tides of the Hudson river. It is marked with a groove upon its perpendicular eastern face for its full height, at a distance of two feet south from its northerly end, and is further marked with the words "Latitude 41° North" and on the north side of the groove the words "New York" and on the south side thereof the words "New Jersey." (See photographs.)

The monument at the western terminus of the line is of cut granite, two feet four inches long, one foot four inches wide, and projects now only one foot five inches above the surface of the rock in which it is embedded. It is marked upon its top surface with one-quarter-inch grooves, showing the direction of the lines of the three states which meet there, and within the surface bounded by the lines the initials of the respective states are cut. The north side of the stone is further marked with the words "Tri States Monument." Each of these terminal monuments has a witness, or reference, monument located in the most suitable place nearest to it. (See photographs.)

LINE MONUMENTS BETWEEN HUDSON AND DELAWARE RIVERS

Examination

The examination of the boundary from the Hudson river to the Delaware river was begun at Station rock on the Hudson river on May 5, 1919. The monuments, with few exceptions, hereinafter noted, were found in good condition. Some of the original mile monuments set in 1774 are gone or lie flat near the granite monuments set in 1882 to further preserve the mile points. Several of the road monuments are covered through raising of grade or other construction and one has three feet of its length exposed and leans against a reservoir wall. Most of the monuments are chipped at the corners and edges, and a few lean slightly, though still firmly imbedded.

The policy of informing residents concerning the location of the

monuments and impressing them with the importance of preserving the same, and the practice of changing the names of the title owners in the detailed descriptions of the monuments, to conform with transfers, have been followed consistently. Where the old witness points have disappeared, new ones have been chosen and noted. Where access to a monument is difficult, notes giving directions have been added at the end of the detailed description. These descriptions follow as a part of this report. Considerable time was lost by the lack of topography on the official boundary maps, especially new roads, probably laid out since those maps were made. This information, we believe, may be obtained from official records and should be plotted and placed on the tracings prior to the next inspection.

Photographs were taken of the terminal and witness monuments and copies of these accompany this report.

Recommendations

For the proper preservation of the boundary between the Hudson river and Port Jervis on the Delaware river, we desire to make the following recommendations:

(1) That the latitude inscription on the eastern terminal monument at the foot of the Palisades be recut, as it is nearly obliterated, and that the pole and sign-board be painted.

(2) That a sign be placed at the eastern witness, or reference, monument, warning against chipping or defacing this monument, as several large pieces have been broken from the edges in a shameful manner. (See photograph.) Also that the Inter-state Palisades Park Commission, now opening paths in this section, be requested to open a path along the New York–New Jersey line from this monument to the boulevard so that the same may be readily reached by the citizens of both States.

(3) That monument No. 15, covered with road material, be raised and reset in concrete.

(4) That monument No. 20, situated on the slope of a hillside be reset in concrete.

(5) That monument No. 23, which is on a sloping hill, loose and about ready to fall, be reset in concrete.

(6) That a new monument be set in concrete in place of No. 43, which is under cement curb and sidewalk.

(7) That monument No. 44 be raised to grade of railroad and set in concrete.

(8) That monuments Nos. 52 and 53 be moved to the new roads near-by, as roads on which they are now located are abandoned.

(9) That monument No. 96 be relocated and reset in concrete, as it is now exposed and leaning against a reservoir wall.

(10) That monuments Nos. 113 and 115, now covered, be raised and set in concrete.

(11) That the official maps showing the monuments between the Hudson and the Delaware be brought down to date.

LINE MONUMENTS IN RARITAN BAY AND RANGE MONUMENTS IN ARTHUR KILL, KILL VON KULL, NEW YORK BAY (UPPER) AND HUDSON RIVER

Examination

After completing the examination from the Hudson to the Delaware river your engineers proceeded immediately to Perth Amboy for the inspection of the monuments lying in Raritan bay, Arthur kill and Kill von Kull. Practically all these monuments are in good condition. A few we were unable to find. Owing to the rapid upbuilding of this territory, principally by industrial plants, a considerable number of these monuments are surrounded by or inside buildings. Also quite a few are several feet below grade. In such cases a wooden box, terra-cotta pipe or other device with a wooden cover surrounds the stone and extends to a point near the present surface of the ground. In a few instances we found the covers removed and the holes filled with debris. These covers being of a very temporary character and the grade having been established, we recommend that these monuments be raised to grade and, if possible, where now located among or within buildings, a new point in the range be chosen, from which sights may be readily taken. These are enumerated in our list of specific recommendations which will be found later in this report. As on the north boundary, we found ourselves much inconvenienced by the ancient topography on the official charts.

No inspection was made of the section from New York bay to

Station rock on the Hudson river, as we had no description of these points. Since returning from the field, however, we have made an examination of the history of the boundary and found in the "Report of the Riparian Commissioners of New Jersey for the year 1891" a detailed description of all range points on this portion of the line. They consist of crosses in rocks, church spires, chimneys, public buildings, U. S. Coast and Geodetic Survey monuments, etc. From the best information obtainable it appears these have never been examined since they were established. In view of the fact that this is the most valuable section of the whole territory we recommend that an inspection be authorized and data procured as to amount of work necessary to mark this portion of the boundary to conform with the remainder. An estimate of cost should be included.

Recommendations

For the better preservation of the boundary from Raritan bay to Station rock on the Hudson river we respectfully submit the following specific recommendations:

(1) That an examination be authorized of the section between New York bay and Station rock on the Hudson river.

(2) That the Permanent monument and the Morgan beacon be repainted.

(3) That monuments Nos. 4, 6, 8, 14, 20, 23, 24, 47, 48, 49 and 51 be raised to grade and where situated in a building or surrounded by buildings, a more favorable location be chosen, if practicable.

(4) That monument No. 34 be raised and set in concrete (or a new one set in this range) and located by angles and distances from New York city and U. S. Coast Survey monuments near-by.

(5) That monuments Nos. 41, 42, 43 and 44 be reset in concrete in the roadbed of the B. & O. R. R.

(6) That a new monument be set in concrete near the highway at the edge of the meadow in place of No. 45, which is covered.

(7) That a new map showing topography (except contours) of all the section from Raritan bay to Station rock on the Hudson be compiled in sections of suitable size, marking the names of roads or streets leading to monuments and the names of industrial plants within which monuments are situated. We suggest a scale of one inch to one thousand feet for this map.

To do all the above work there should be a combined appropriation of $10,000, or $5,000 from each State.

Respectfully submitted,

HENRY J. SHERMAN,
Engineer for New Jersey.

H. F. EAGAN,
Engineer for New York.

Dated June 25, 1919.

MONUMENTS ACROSS LANDS UNDER WATER IN RARITAN BAY

A detailed description follows of the location and condition of the monuments, structures and buoys marking that part of the New York and New Jersey boundary line lying across lands under water in Raritan bay.

Romer Lighthouse or Beacon

In good condition.

Permanent Monument

Needs repainting; otherwise in good condition.

Morgan Range Beacon

Consists of a triangular steel tower, about 56 feet high, set on three concrete piers, with a large rectangle of steel at the top as the beacon; all in good condition. It is located on the highland about one mile south of South Amboy, N. J., and about 1,000 feet north of Morgan Station on the New York and Long Branch R. R., on land of the Otis Sand Lime Brick Co., back of their brick manufactory. It is in the prolongation of the line between the Romer lighthouse and the permanent monument. Underneath the rectangular beacon there is an 8-inch by 12-inch granite monument, the southeast corner of which is slightly chipped; otherwise it is in good condition. The steelwork needs repainting.

Great Beds Lighthouse

In good condition.

NOTE.— For the report of the Commission appointed to locate the boundary line in Raritan bay, Arthur kill, Kill von Kull, New York bay, and Hudson river, see the report of the State Engineer and Surveyor for 1896, pages 361–5. For maps of these same sections of the line, see the report of the State Engineer and Surveyor for 1900, facing pages 252 and 254.

MONUMENTS ACROSS LANDS UNDER WATER IN ARTHUR KILL AND KILL VON KULL

A detailed description follows of the location and condition of the range monuments marking that part of the New York and New Jersey boundary line lying across lands under water in Arthur kill and Kill von Kull.

Monument No. 1

This monument is located at Perth Amboy, N. J., in the rear of an old blacksmith shop fronting on Front street and on land of I. B. Eissenberg. It is 3 feet from the doorway, 52.9 feet south of the southeast corner of the brick building of Schantz & Eckert, now used as a storehouse, and 29.0 feet southwest of the southwest corner of the brick portion of the foundry. The said blacksmith shop adjoins the marine railway of Gray & Sons on the north. This monument has its top flush with the surface of the ground. Its northeast and northwest corners are broken and its easterly and westerly edges chipped; otherwise in good condition.

Monument No. 1-A

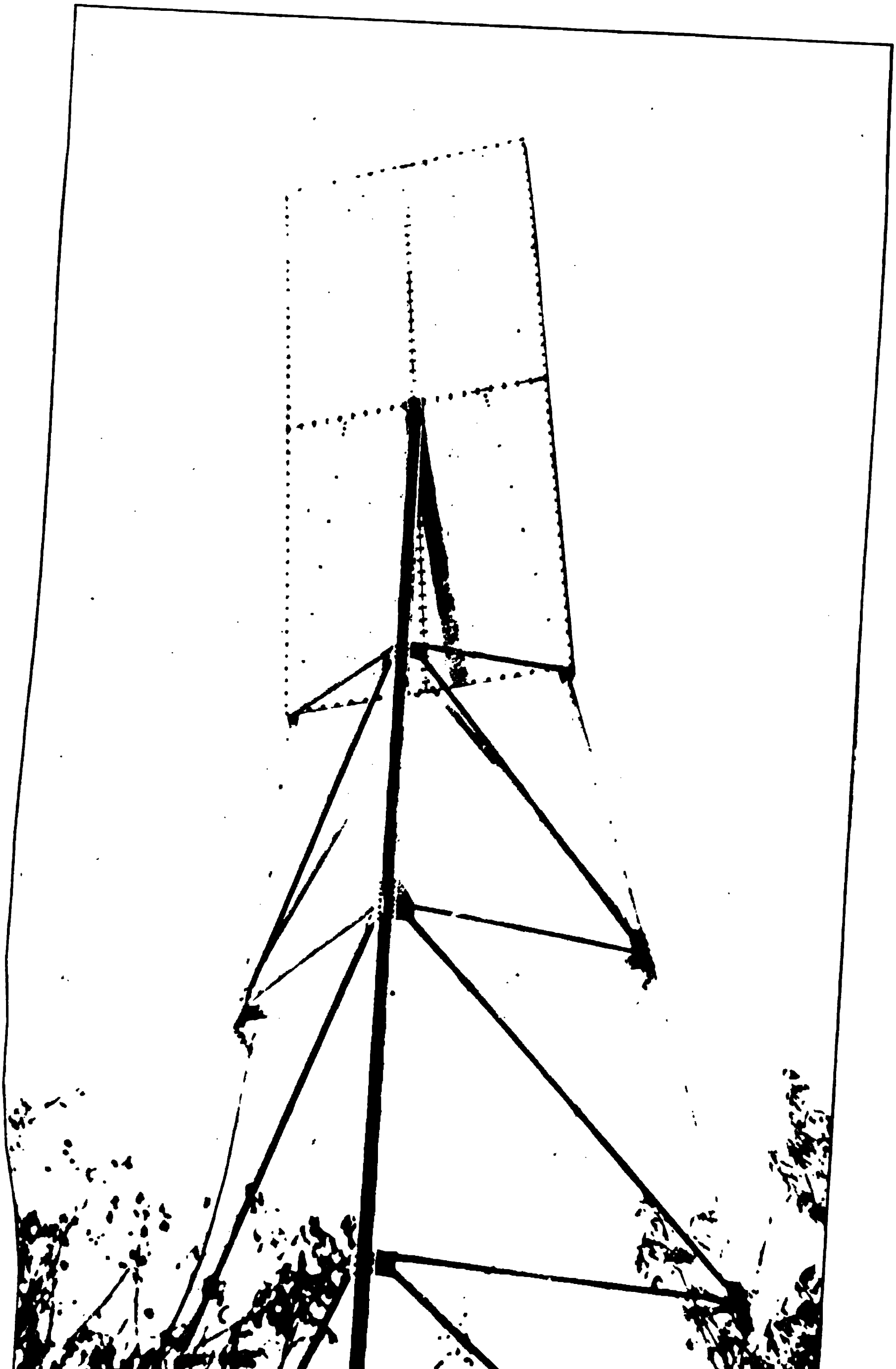
Quoting from the Engineers' joint report of October 8, 1913:

"This monument, granite, 8 inches by 8 inches by 4 feet long, lettered 'N. Y.–N. J.' on its northerly side and 'No. 1-A' on its southerly side, is located near the northerly line of Front street in Perth Amboy, N. J. It is 43.7 feet southwesterly at right angles from the southwesterly side, or line, produced of Hartmann's Hotel, 0.5 foot northeasterly at right angles from the northeasterly side, or line, produced of house No. 277 Front street and 2.26 feet easterly from the easterly corner of said last mentioned house No. 277.

"It was set August 11, 1913, on range, or in line, between monument No. 1 and the Great Beds lighthouse and is distant 109.01 feet northerly on said range from said monument No. 1."

This monument is covered with about two inches of earth and has its southerly edge slightly chipped; otherwise in good condition.

Permanent Monument, Raritan Bay



Morgan Range Beacon

Monument under Morgan Range Beacon

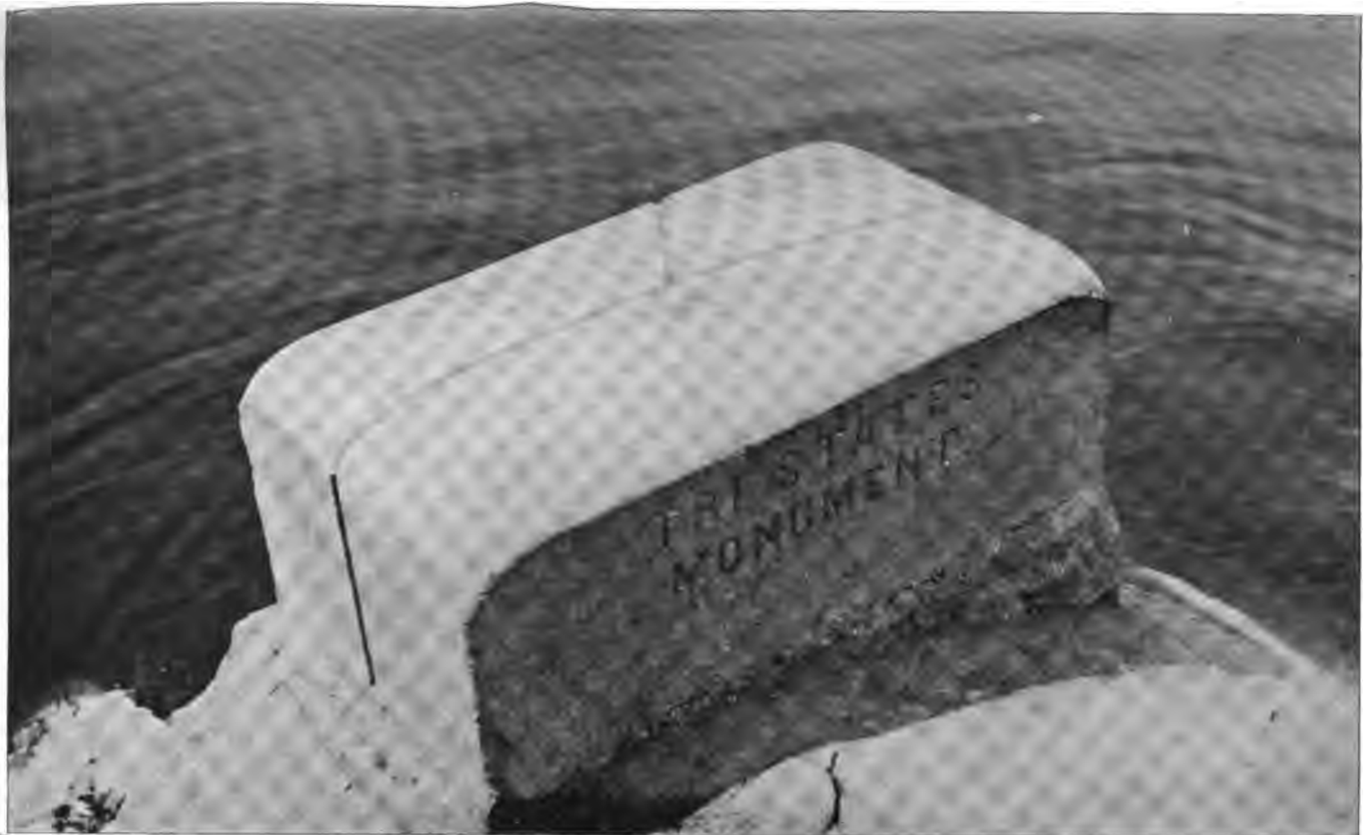
Eastern Terminal Monument, "Station Rock"

General View, Station Rock and Sign-post, near the Hudson River

EASTERN WITNESS MONUMENT, NORTH SIDE

Eastern Witness Monument, South Side

Western Witness Monument



TRI-STATES MONUMENT (WESTERN TERMINUS)

Monument No. 2

This monument is located at Tottenville, S. I., on land of Jere Johnson. It is about 52 yards north of the line fence between lands of Jere Johnson and G. T. Brewster, and about 32 yards easterly from high-water line of the sound on a fairly steep westerly slope. At the monument the following bearings and distances were taken: N 40° E, 25.5 feet to a large red oak tree; N 38° W, 56.5 feet to a large dead twin oak tree, and S 15° W. 44.5 feet to a black oak tree. This monument is covered with about two inches of soil washed from the hillside and has its westerly corner slightly chipped; otherwise in good condition.

Monument No. 3

This monument is located at Tottenville, S. I., on land of Frederick Baxter, 77.7 feet northwest of the northwest corner of Benjamin Williams' house and 88.5 feet, about due west, from the southwest corner of Frederick Baxter's house. This monument has three of its corners and two of its edges slightly chipped and leans a trifle to the west; otherwise in good condition. It is set in concrete.

Monument No. 4

This monument is located at Tottenville, S. I., on land and premises of Alfred Baxter, now occupied by George D. Emmons. It is 27.7 feet northwesterly from the northeasterly corner and 21.23 feet northeasterly from the northwesterly corner of the brick foundation of said Baxter's house; also 137.23 feet easterly from monument No. 3 and about 17 feet southerly from a large beech tree. It is about 3 feet below the present surface of the ground and protected by one length of 15-inch vitrified pipe, which is covered with a two-inch spruce cover, partially decayed, over which there is about eight inches of earth. Its northerly corner is slightly chipped; otherwise in good condition.

Monument No. 5

This monument is located at Tottenville, S. I., on lands of Adeline Dorcey, about 150 feet east of the road leading to the Perth Amboy ferry. At the monument the following bearings and distances were taken: S 20° E, 50.1 feet to the northeast corner of

double house occupied by Mrs. Murphy and Mrs. Pryor; S 65° W, 76.2 feet to the southeast corner of S. N. Boderson's barn; N 10° E, 17 feet to wild cherry tree, and N 80° E, about 12.0 feet to a line fence. This monument has its corners and easterly edge slightly chipped; otherwise in good condition.

Monument No. 6

This monument is located at Tottenville, S. I., on land now a shipyard, belonging to Harry Cossey. It is 156 feet northwesterly at right angles from the northwesterly side of Cossey's corrugated iron sawmill; 9.8 feet southwesterly from the northeasterly side, or line, of said Cossey's sawmill produced; about 129 feet southwesterly from his northeasterly bulkhead; 10.5 feet east of end of near rail of siding, and 8.8 feet east of east gage line. It is about 3 feet below the present surface of the ground and protected by one length of 12-inch vitrified pipe, covered with a 5-inch yellow pine cover, over which there is about 12 inches of earth. It is in good condition, but should be reset to grade and set in concrete.

Monument No. 7

This monument is located at Tottenville, S. I., on land of Tottenville Shipyard Co., 82 feet westerly from Fisher avenue and 15 feet northerly from remains of an old fence. At the monument the following bearings and distances were taken: S 80° E, 36.0 feet to a large willow tree; N 50° E, 61 feet to another large willow tree; 43.8 feet south of southwest cornor of blacksmith shop; 62.7 feet southeast of northwest corner of said shop, and four paces north of ditch. This monument has its easterly and westerly edges slightly chipped; otherwise in good condition.

Monument No. 8

This monument is located at Tottenville, S. I., on land of the Atlantic Terra Cotta Co. At the monument the following bearings and distances were taken: N 10° E, 63.4 feet to the southwest corner of the office building; N 60° E, 7.0 feet to the northwest corner of the pressing building; S 10° E, 51.6 feet to the northeast corner of the dwelling house of the Company and 8 inches east of west face of pressing building. This monument is about in the

center of the roadway leading to the office and about 3 feet below the present surface. It is protected by an 8-inch tile pipe 2 feet in length with cast-iron cap about 8 inches below surface. This monument was otherwise in good condition.

Monument No. 9

This monument is located about one-half mile north of Kreischerville, S. I., opposite Sewaren hotel, N. J., 1 foot south of a line fence, now nearly gone, between lands of Powell and formerly Charles Hughes, now Floyd S. Corbin; about 275 feet from Arthur kill and 25 feet west of drive to Mr. Corbin's house. At the monument the following bearings and distances were taken: S 10° W, 140 feet to a wild cherry tree 6 inches in diameter; N 80° W, 129.0 feet to a pear tree, and N 10° E about 104 yards to the southeast corner of Corbin's old house. This monument was found to be in good condition in every respect.

Monument No. 10

This monument is located at Sewaren, N. J., on land of C. A. Cuppia, 7 feet inside of hedge fence along Holton street and 42 feet inside of hedge fence along Cliff road. At the monument the following bearings and distances were taken: N 20° W, 49.7 feet to the southeast corner of Cuppia's house, and S 80° W, 10.2 feet to a horse-chestnut tree. This monument has its edges slightly chipped; otherwise in good condition.

Monument No. 11

This monument is located at Sewaren, N. J., on land of F. Van Syckle on the north side of the drive leading to his house, about half-way up the slope of said drive and just under the sod. At the monument the following bearings and distances were taken: S 65° E, 20.13 feet to the southwest corner of southerly gate-post just under cap at entrance to drive; N 60° E, 23.92 feet to the northwest corner of northerly gate-post just under cap at entrance to drive, and 38.28 feet northerly to the line fence between lands of F. Van Syckle and Charles Ballard. This monument has its northwest corner slightly chipped; otherwise in good condition.

Monument No. 12

This monument is located on the southeast side of Cliff road in a line of maple trees, about one-half mile north of Sewaren. At the monument the following bearings and distances were taken: S 60° E, 144.4 feet to a large black oak tree, standing alone, near the line between upland and meadow; N 30° W, 105 yards to a semaphore signal, "A 172", on the right of way of the C. R. R. of N. J., and S 35° W, 33.0 feet to a maple tree. This monument has its northeast and northwest corners broken and southeast and southwest corners slightly chipped; otherwise in good condition. It is set in poor concrete.

Monument No. 13

Quoting from the Engineers' joint report of October 8, 1913:

"After quite an extensive survey connecting monuments Nos. 12, 14, 15 and U. S. H. L. monument 'M' on Tufts Point and calculations therefrom, the theoretical, or recorded, position of monument No. 13 was found to be on land of the Philadelphia & Reading R. R. Co. among the tracks usually occupied by loaded coal cars at Port Reading, N. J.

"On September 4, 1913, an attempt was made to find and locate monument No. 13 on the ground by means of the above survey and calculations and by direct measurements over the coal cars from our nearest survey station, with the result that it was not found, in consequence of its theoretical, or recorded, position being in or near the center of one of the many tracks fully occupied by loaded coal cars, which made the question of a further search by digging prohibitive.

"In view of this fact it was deemed advisable to set another stone on the same range with Nos. 13 and 15 and designate it as 13-A."

Monument No. 13-A

Quoting from the Engineers' joint report of October 8, 1913:

"This monument, granite, eight inches by eight inches by 3.3 feet long, lettered 'N. Y.–N. J.' on its northerly side and 'No. 13-A' on its southerly side, is located at Port Reading, N. J., on land of the Philadelphia & Reading R. R. Co. It is in the same

line, or range, with monument No. 15 and the theoretical, or recorded position of monument No. 13 and distant 765.95 feet northwesterly therefrom. It is 27.65 feet southeasterly from an iron pump, 36 feet northeasterly from the northeasterly corner of a frame shack and 99.4 feet westerly from the southwesterly corner of another shack.

"It was set September 8, 1913. . . .

"At the monument the following bearings were taken: N 75° E to chimney of the American Agricultural Chemical Co. (Liebig Works) and S 82° E to the northerly one of two water towers on land of the Philadelphia & Reading R. R. Co.

"The theoretical, or recorded, position of monument No. 13 as used above is determined by computations by Mr. William B. Moss, Civil Engineer, of New York city (based on the U. S. C. S. station 'Bogart') and our survey connecting monument Nos. 12, 14 and 15 and U. S. H. L. monument 'M' on Tufts Point."

Monument 13-A is 4 feet southeast of electric light pole No. 40 and near a colony of shacks. This monument has its corners and three of its edges slightly chipped; otherwise in good condition. To reach it take first road to east from main road, north of Port Reading P. O.

Monument No. 14

This monument is located in township of Woodbridge, N. J., about one-half mile west of the borough of Roosevelt on land of the Philadelphia & Reading R. R. Co. At the monument the following bearings and distances were taken: S 5° E, 76.9 feet to the northeast corner of the storehouse of the creosoting plant; N 85° E, 235.5 feet to a steel rail set on end in the ground as a monument at the northeast corner of land of the Port Reading R. R. Co., which corner is 37.0 feet southerly from the centre of a new street, and S 15° E, 466.3 feet to the northwest corner of the brick office building of the creosoting plant. This monument now stands 3 feet below the present surface of the filling and is protected by a yellow pine box made of 4-inch plank. It has three of its corners chipped and easterly corner broken; otherwise in good condition. It should be raised to grade and set in concrete.

Monument No. 15

This monument is located about one-half mile northwest from Rossville, S. I., on land of the Oakland Chemical Co., about 407 feet on range line from the kill and 32.0 feet on range line from the line between upland and meadow. At the monument the following bearings and distances were taken: N 80° E, about 160 feet to the northwest corner of the concrete office building of the company, 72.9 feet north of angle in high fence of company; S 35° W, about 85 paces to the northeast corner of C. C. F. Disoway's house, and N 45° W, 42.0 feet to a large tree. This monument has its northwest, southwest and southeast corners slightly chipped; otherwise in good condition.

Monument No. 15-A

This monument, 6 inches by 6 inches, granite with copper plug in centre, was located about one-half mile northwest from Rossville, S. I., on land of the Oakland Chemical Co., in range with monuments Nos. 13 and 15 and distant 200 feet southeasterly from No. 15 and about on line between Chemical Co.'s water-tower and C. C. F. Disoway's house. This monument was removed in 1916 in consequence of the grading, etc., for a new kiln building.

Monument No. 16

This monument is located at Rossville, S. I., on land of Mrs. Hattie Lyon, 25 feet west of the line fence between lands of Mrs. Lyon and Miss Mary Cole and about 65 feet southwest of high-water line of the kill, in swampy ground and set about 6 inches above the surface. At the monument the following bearings and distances were taken: S 50° E, 27.2 feet to a thorny locust tree; N 20° W, 36.2 feet to an elm tree, and S 80° W, 86.5 feet to a large willow tree. This monument has its southerly edge chipped and top chiseled; otherwise in good condition.

Monument No. 17

This monument is located at Rossville, S. I., on land of Miss Mary Cole, 2.3 feet east of fence which separates her house lot from pasture and 87.0 feet along said fence from the Shore road

and about 46 paces west of watercourse. At the monument the following bearings and distances were taken: N 85° W, 8.5 feet to a pear tree, and S 20° E, 45.8 feet to a small apple tree. This monument has three of its corners and three of its edges slightly chipped and top chiseled; otherwise in good condition. Lettering on east and west sides.

Monument No. 18

This monument is located at Rossville, S. I., on lands of Mrs. Harriet Clark, on the southerly side line of the Shore road, 22.6 feet easterly from the line fence between lands of Mrs. Clark and V. C. F. Disoway and about 70 feet west of St. Luke's avenue. At the monument the following bearings and distances were taken: N 80° E, 21.0 feet to a cherry tree; N 30° W, 54.2 feet to the southwest corner of a frame storehouse, and S 20° W, 65.3 feet to the northeast corner of Disoway's house. This monument has its northeast and southeast corners slightly chipped and top chiseled; otherwise in good condition. Lettering on east and west sides.

Monument No. 19

This monument is located about one-quarter mile east of the Rossville, S. I., post-office, on land of Franklin Post, on the northerly slope from Fresh Kills road, about 10 feet from line between upland and meadows, surrounded with sassafras bushes and poison ivy. At the monument the following bearing and distance was taken: S 45° W, 9.0 feet to a small sassafras tree. This monument leans a trifle to the north and has its northerly and westerly corners slightly chipped and top chiseled; otherwise in good condition. Lettering on northeast and southwest sides.

This monument may be found by producing northerly the easterly side, or line, of the large frame dwelling with four large columns in the front, now occupied by Mrs. A. G. Decker, and from thence going easterly 46.0 feet to the monument.

Monument No. 20

This monument is located in the borough of Roosevelt, N. J., on land of the United States Metal Refining Co. It may be located as follows: Produce the center line of iron columns forming the

southerly side of the smelter building and measure 79.0 feet westerly from the center of the corner iron column and from said point measure 33.5 feet southerly at right angles from the aforesaid line to the monument, which is encased in a wooden box, 10 inches by 12 inches, which stands just northeast of the northeasterly rail of the granulated slag track of the company, and about 2 feet below the top of ties. This monument, owing to the kind consideration of the company, has been carefully located and protected as above and in consequence is now readily found. It is in good condition. It should be raised to grade and set in concrete.

Monument No. 21

This monument is located in the borough of Roosevelt, N. J., on land of the Goldschmidt Detinning Co., 6 feet south of new north fence of said company. It may be located as follows: 87.0 feet east of the easterly side, or line, of the Goldschmidt Detinning Company's frame building produced northerly and 10 feet west of a small ditch dividing the meadow from the upland. This monument leans a trifle to the north and projects more than usual; otherwise in good condition.

Monument No. 22

This monument is located in the borough of Roosevelt, N. J., on land of the American Agricultural Chemical Co. (Liebig works). It may be located as follows: 499 feet southeasterly from monument No. 23, 10.7 feet easterly from the easterly side, or line, of the brick digester plant (main building, not extension) produced northerly and 21.3 feet north of the northerly side, or line, of the aforesaid building produced easterly. This monument has its corners and edges worn and chipped; otherwise in good condition.

Monument No. 23

This monument is located in the borough of Roosevelt, N. J., on upland of the American Agricultural Chemical Co. (Liebig works). At this monument the following bearings and distances were taken: N 50° W, 42.6 feet to a swamp oak tree stump standing alone; S 30° W, 95.5 feet to the northeast rail of a double track branch railroad, or spur, running into the Liebig works;

S 35° W, 175 paces to high brick stack of Liebig Co., and easterly about 10 feet to an open ditch, or drain. This monument has been covered by dredge fill. A section of steel rail 6 feet high marks the point. This monument leans a trifle to the south and has all four corners and two of its edges slightly chipped; otherwise in good condition. It should be raised to grade and set in concrete.

Monument No. 24

Quoting from the Engineers' joint report of October 8, 1913: "This monument is located in the borough of Roosevelt, N. J., on land of the Warner Chemical Company. It is 8.8 feet southwesterly from the northeasterly side, or line, produced and 7.4 feet southeasterly from the southeasterly side of the main brick building of the Company . . . It is 323.27 feet northerly from U. S. monument 'N' at the foot of Rahway avenue and at an angle of 68° 57′ 54″ in the northeast quadrant from monument 'N' and Melvin's chimney on Staten Island. It is . . . about 2 feet below the outside surface of the ground. It is protected by one length of 8-inch vitrified pipe, covered with a 6-inch yellow pine cover, over which there is about 6 inches of earth. It has its westerly corner slightly chipped, otherwise in good condition." This monument is entirely surrounded by buildings and should be located at a more suitable point.

Monument No. 25

This monument is located at Linoleumville, S. I., in edge of meadow and upland of American Linoleum Manufacturing Co., about 600 feet north of the northerly fence of the present plant of the company, which runs about N 60° E and S 60° W. At the monument the following bearings and distances were taken: N 35° E, 12.8 feet to a small oak stump; S 80° E, 25.8 feet to an oak stump; S 50° W, 25.8 feet to an oak stump 3 feet high, and N 40° W, about 5.0 feet to the line between upland and meadow. The monument has its corners and three of its edges chipped; otherwise in good condition.

Monument No. 26

This monument is located in the borough of Roosevelt, N. J., on land of Geo. F. Gantz. At the monument the following bearings and distances were taken: N 25° E, 60.5 feet to the remains

of an old stone wall (the highest stack is on this same range); S 55° E, 126 feet to a small ditch about at the edge of the meadow (the stack of the Williams & Clark Fertilizing Works is on this same range); and S 40° W, 132.2 feet to the nearest rail of three-track branch railroad running to the Williams & Clark and other plants, and an additional distance of about 250 feet to a pin oak tree on this range, between poles Nos. 21 and 22 along railroad; S 65° W to northeast corner apple orchard and house belonging to Henry Bunce 500 feet back of Rahway avenue. This monument has its easterly corners and easterly edge slightly chipped and westerly edge broken and projects more than usual; otherwise in good condition.

Monument No. 27

This monument is located at Linoleumville, S. I., on land of Peter Cannon, about 285 feet N 15° E from house now occupied by Mrs. Murphy, on southerly side of Burning Hill road. At the monument the following bearings and distances were taken: S 80° E, 22 yards to an English poplar tree; S 45° E, 25 yards to a twin English poplar tree; S 5° W, 38 yards to another English poplar tree, and N 80° W, about 167 feet to monument No. 28. Monument No. 27 is set in concrete and about one foot above ground and has its corners and northerly edge slightly chipped; otherwise in good condition.

Monument No. 28

This monument is located at Linoleumville, S. I., on land of Peter Cannon. It is about 167 feet northeast of the center of Burning Hill road, about 20 feet southeast of creek and about 167 feet west of monument No. 27. This monument has its corners and edges slightly chipped; otherwise in good condition. It is set in concrete and extends a foot above ground.

Monument No. 29

This monument is located at Linoleumville, S. I., in meadow land now or formerly of Mr. Meyer. It is about 200 feet northeast of a large creek and about 50 feet east of the kill, 60 feet more or less west of mud bank and 6 inches above meadow. This monument has its corners and easterly edge chipped; otherwise in good condition.

Monument No. 30

This monument is located in the township of Linden, N. J., on land of the Montgomery Co., about 160 feet south of the Tremley lane and 15 feet north of a small ditch dividing the upland from the meadow. At the monument the following bearings and distances were taken: N 80° E, 45.2 feet to a small twin pear tree; S 20° E, 4.6 feet to a small thorn-apple tree, and N 20° W, 9 paces to a twin maple tree. This monument leans a trifle to the south and west; otherwise in good condition.

Monument No. 31

This monument is located in the township of Linden, N. J., on land of the Montgomery Co., 355.5 feet northeast of monument No. 30. At the monument the following bearings and distances were taken: N 60° E, 81.0 feet to the nearest rail of a single-track branch railroad, called Carteret branch of C. R. of N. J.; N 10° E, 53.0 feet to an angle in a ditch separating the upland from the meadow. This monument leans a trifle to the west and has its corners and easterly edge broken; otherwise in good condition.

Monument No. 32

This monument is located in the township of Linden, N. J., on land of the Montgomery Co., several hundred feet north of Tremley lane and on the north edge of woods near where it turns sharply to the west. At the monuments the following bearings and distances were taken: N 65° W, 38.0 feet to a small twin oak tree at the corner of the woods where it turns sharply to the west; N 25° E, 81.0 feet to a ditch 63 feet south of the angle in the woods (the highest stack is on this same range); S 50° W, 30.7 feet to an oak tree, and S 10° W, 26.7 feet to another oak tree standing on the edge of the woods. This monument leans a trifle to the southwest and has its easterly and westerly corners and northerly and southerly sides broken; otherwise in good condition.

This monument is on the edge of meadow, N 40° W, 800 feet, more or less, from monument No. 31; N 65° W from crematory stack on Richmond Hill, S. I.

Monument No. 33

This monument is located on Prall's island, about 800 feet south of northerly end and about 240 feet west of easterly side of island, also about 120 feet west of swamp hole about 25 feet in diameter, also 44 feet east of the range of a stack in Chelsea and a church spire in Linoleumville, the bearing of the range being about S 10° E. This monument was not found in consequence of this section of the island having been filled in.

Monument No. 34

This monument is located at Bloomfield, S. I., on meadow land now or formerly of J. S. Drake, about 900 feet north of the kill opposite Prall's island, about 1,000 feet east of the kill around the turn, or bend, from the above, and about 750 feet N 60° W from U. S. C. S. monument No. 24. This monument may be readily located by measuring 6.0 feet northeast of the range of a frame building with cupola and flag pole (church or school) and stack of crematory on the summit of Richmond, bearing S 55° E. (After careful search of more than a half day and following description carefully, could not find this monument.)

Monument No. 35

This monument is located at Bloomfield, S. I., on upland now or formerly of Mrs. Scudder, on the north side of the second point of upland south of the B. & O. R. R., about 20 feet south of the edge of the meadow. (It may be reached via Lambert avenue.)

At the monument the following bearings and distances were taken: N 65° E, 38.3 feet to a white oak tree standing near the edge of the meadow; S 30° W, about 500 feet to chimney of house occupied by Rooney Decker (house burned down and chimney gone May 15, 1919); N 80° W, 115.2 feet to monument No. 36, and N 20° W, 13.7 feet to a four-legged white oak standing near the edge of the meadow. This monument has its corners and edges slightly chipped; otherwise in good condition. It is set in concrete.

This monument may be readily located by measuring 124 feet westerly from the range of water-tank and stack of Procter & Gamble's soap plant.

Monument No. 36

This monument is located at Bloomfield, S. I., on upland now or formerly of Mrs. Scudder, on the north side of the second point of upland south of the B. & O. R. R., about 75 feet east of the point and 5 feet south of the edge of the meadow. At the monument the following bearings and distances were taken: S 80° E, 115.2 feet to monument No. 35; about due south, 12.5 feet to a three-legged black oak and 27.0 feet to a four-legged black oak, and N 80° W, 23.7 feet to a small white oak tree standing near the edge of the meadow. This monument has three of its edges slightly chipped; otherwise in good condition.

Monument No. 37

Quoting from the Engineers' joint report of October 8, 1913:

"This monument was located on Buckwheat island in Arthur Kill, but, from measurements made on September 11, 1913, we find that it has been removed from the erosion of that portion of the island on which it stood."

Monument No. 37-A

Quoting from the Engineers' joint report of October 8, 1913:

"This monument, granite, eight inches by eight inches by 3.7 feet long, lettered 'N. Y.–N. J.' on its northerly side and '37-A' on its southerly side, was located and set in concrete on Buckwheat island in Arthur Kill, on September 25, 1913, as follows: Seventy feet westerly from the position of monument No. 37 as defined on the 'Revised Map of Pierhead and Bulkhead Lines for both shores of Arthur Kill or Staten Island Sound, from Raritan Bay to Storys Flats, as recommended by the New York Harbor Line Board, April, 1911,' approved September 28, 1911, and at right angles with the line joining said monument No. 37 as above defined and monument No. 40.

"The position of monument No. 37 as adopted and used in the location of monument No. 37-A with reference to other monuments, was as follows: In line, or range, with monument No. 33 on Chelsea, or Pralls island and U. S. H. L. monument 'B' on Buckwheat island and distant 191.9 feet northerly from U. S. H. L. monument 'A,' also on Buckwheat island. This latter

monument 'A' was found to be 0.39 foot east of the said line joining monuments No. 33 and 'B,' which variation from alignment is very likely due to the dredging of the channel of Arthur Kill, which approaches nearer the southerly end of the island than it does the northerly end and hence its disturbing effects are greater at 'A' than at 'B.'"

This monument was found to be in good condition.

Monument No. 38

This monument is located at Linden, N. J., on upland of the Standard Oil Co. of N. J., about 40 feet west of line between upland and meadow. It is about 540 feet southwest of a single-track branch railroad running through Railroad avenue from Standard Oil plant to C. R. R. of N. J., Long Branch division. At the monument the following bearing was taken: N 30° W, about 325 feet to gas tank No. 2, the middle one of three standing alone. It is 180.4 feet east of wire fence on easterly right-of-way line of Public Service Fast Line to Perth Amboy and 278 feet east of picket fence east of gas tank No. 2. This monument has three of its corners broken and its westerly edge chipped and leans a trifle to the northwest; otherwise in good condition.

To reach monuments Nos. 38 and 39, enter gate at Railroad avenue, proceed easterly to Public Service Fast Line tracks. No. 38 is south of and No. 39 north of this intersection.

Monument No. 39

This monument is located at Linden, N. J., on upland of the Standard Oil Co. of N. J., about 5 feet north of line between upland and meadow and about 1,200 feet northeast of monument No. 38 and nearly opposite tank No. 421 of Standard Oil Co. of N. J. It may be readily located by measuring 5.8 feet easterly from the easterly side, or line, of brick paraffin pump-house produced and 141.0 feet southerly from the southerly side, or line, of the aforesaid building produced, 22.1 feet east of east gage line of northbound Public Service track and 19 feet west of fence on east side of right of way of said railway. This monument has its corners and edges chipped; otherwise in good condition. (See note under No. 38 for directions to reach this monument.)

Monument No. 40

This monument is located at Bay Way, N. J., on land of the Waclark Wire Co., or Realty Co., near the mouth of Morse's creek, 5 feet northwest of high-water line of Arthur kill, 100 paces southwest of high fence of Waclark Co. At the monument the following bearing and distances were taken: N 65° E, about 390 feet to stack of the Waclark Wire Co., and 65 paces east of west curb of South Front street. This monument has its northeast corner and northerly and southerly edges slightly chipped; otherwise in good condition. It is set in concrete.

Monument No. 41

This monument is located at Holland Hook, S. I., on meadow land of the Staten Island Rapid Transit Railway Co., about 40.0 feet southwest of southwest foot of slope of the B. & O. R. R. embankment, also about 250 feet northeast of Old Place creek and about 350.0 feet southeast of southeasterly abutment of the B. & O. R. R. bridge. This monument was found to be in good condition in every respect.

Monument No. 42

Quoting from Mr. Hopper's report of 1916: "This monument is located at Holland Hook, S. I., on meadow land of J. I. Housman and John Croak, about 300 yards northeast of B. & O. R. R., about 350 yards southeast of the kill and about 120 feet southwest of a creek 10 feet wide.

"At the monument the following bearings were taken: S 85° E to Procter & Gamble's stack; S 40° E to stack of crematory on the summit of Richmond; S 55° W to Standard Oil Co. stack, and N 15° E to twin church spires in Elizabethport.

"This monument was found to be in good condition in every respect, and may be readily located by measuring 6 feet northeasterly from the range bearing about S 65° E of Procter & Gamble's steel water-tank and the next steel water-tank southeast thereof; also by measuring northwesterly 17 feet from the range bearing about N 30° E of flag-pole on Recreation pier and southeasterly spire of twin spires of church in Elizabethport."

As meadow has been filled and some of the range points are gone, we were unable to find this monument.

Monument No. 43

This monument is located at Holland Hook, S. I., on meadow land of John J. Dooley, about opposite Elizabeth Yacht Club house and about 250 feet south of kill. This monument may be readily located by measuring 28 feet easterly from the range of flag-staff on Recreation pier and church with cross on its spire, (both in Elizabethport), bearing N 35° W, also by measuring S 65° W, 177.2 feet from monument No. 44. Monuments Nos. 43 and 44 are both in range with the center of the third bay from the southeasterly end of steel lumber shed and flag-staff on Bohemian Hotel at the ferry to Elizabethport. This monument was found to be in good condition in every respect.

Monument No. 44

This monument is located at Holland Hook, S. I., on meadow land of John J. Dooley, about 100 feet south of kill. At the monument the following bearing and distance were taken: S 65° W, 177.2 feet to monument No. 43, which is in the range of monument No. 44 and centre of third bay from the southeasterly end of steel lumber shed and flag-staff on Bohemian Hotel at the ferry to Elizabethport. This monument was found to be in good condition in every respect. (It is difficult to locate except by measure from monument No. 43, as it is level with the meadow.)

Monument No. 45

This monument is located at Holland Hook, S. I., on meadow land of John J. Dooley, about 140 feet north of creek bridge and about 175 feet west of a branch railroad track from Procter & Gamble's plant to the dock. This monument may be readily located by measuring 27 feet southerly from the range, bearing N 70° W of the southerly corner of the buff brick hotel and southerly side of gas holder, both in Elizabethport, also by measuring 17.5 feet north of the range bearing N 85° W of black, or steel, stack in Elizabethport and the John Stevenson Electrical Sight Clock Tower and Cage (the case has been removed, leaving a portion

of the tower which supports the tank); also by measuring 12 feet westerly from the range of Procter & Gamble's stack (second layout) and steel water-tank.

This monument could not be found. The ranges are gone. Probably it has been covered over by the Procter & Gamble Co.

Monument No. 46

This monument is located at Port Richmond, S. I., on land of John J. and Mary A. Worth, No. 2233 Richmond terrace. This monument may be readily located by measuring 24.3 feet easterly from a line fence and 43.0 feet southerly from the face of a stone bulkhead of the kill in front of this land. This monument is under a privet hedge on east side of cement walk, now covered with about twelve inches of soil, and is in good condition.

Monument No. 47

This monument is located at Port Richmond, S. I., on land of the Standard Oil Co. of N. Y., at No. 2201 Richmond terrace. This monument may be readily located by measuring 3.75 feet northeast from the line fence between lands of the above company and J. E. Donovan, also by measuring 15.7 feet southwesterly from the concrete water white oil building and 28.1 feet southeasterly from the northwesterly side, or line, of the brick gasoline building produced. This monument is now covered with about three feet of filling and has a plank covering on terra-cotta pipe, the plank about 12 inches below surface. It has its northerly corners chipped; otherwise in good condition.

Monuments Nos. 48 and 49

These monuments are both located at Bergen Point, Bayonne, N. J., on land of The Safety Insulated Wire & Cable Co. (No. 48 is under barrels. Superintendent assured us it had not been disturbed.) Quoting from the Engineers' joint report of October 8, 1913:

"No. 48 is within the frame building No. 28. It is 6.9 feet northwesterly from the southeasterly side and 21.5 feet southwesterly from the northeasterly side of said building No. 28. It is

about 2.5 feet below the surface of the ground and is to be protected by the company, by a concrete casing 20 inches square on the inside and 32 inches square on the outside at the top and covered with a suitable cover. It has its corners and edges chipped and leans slightly to the northwest, otherwise in good condition."

This monument is covered by a huge pile of barrels. The superintendent assured us it is in good condition.

Again quoting from the Engineers' joint report of October 8, 1913:

"No 49 is 101.65 feet southeasterly from the southeasterly side of the brick building No. 1 and 109.8 feet northeasterly from the southwesterly side, or line, of said brick building No. 1 produced southeasterly. It is about 1.5 feet below the surface of the ground and is to be protected by the company, by a concrete casing 20 inches square on the inside and 32 inches square on the outside at the top and covered with a suitable cover."

It is in good condition.

Monument No. 50

This monument is located at Bergen Point, Bayonne, N. J., on land now or formerly of Rufus Story. This monument is about 2.7 feet south of the south line of First street, 14.7 feet south of south curb line and about 47.7 feet west of the west line of Lord avenue produced. This monument has its corners and easterly and westerly edges slightly chipped; otherwise in good condition.

Monument No. 51

This monument is located at West New Brighton, S. I., on land of C. W. Hunt, in rear of frame building No. 1589 Richmond terrace, now used as rope department by the owner. It is about 4.5 feet below the present surface of the ground and is protected by brickwork with an iron cover. This monument may be readily located by measuring 15.95 feet northerly from the northerly side and 29.2 feet easterly from the westerly side produced of the above building, also by measuring 39.1 feet southerly from the southerly rail of the east-bound track of the Staten Island Rapid Transit railway, also by measuring 114.5 feet easterly from the westerly

line fence of the C. W. Hunt property. This monument has its northeasterly edge slightly chipped; otherwise in good condition. It should be raised to grade and set in concrete.

Monument No. 52

This monument is located at Bergen Point, Bayonne, N. J., on land of the Gulf Refining Co., about 4 feet below the surface of the ground and is protected by the company by a concrete casing 20 inches square on the inside and 32 inches square on the outside at the top and covered with a 3-inch yellow pine cover. It may be readily located by measuring 44.46 feet easterly from the easterly side of oil tank No. 206, and 48.15 feet southerly from the southerly side of oil tank No. 211. This monument leans a trifle to the east and has its corners and northerly and southerly edges slightly chipped; otherwise in good condition.

Monument No. 53

This monument is located at Livingston, S. I., on land (right of way) of the Staten Island Rapid Transit Railway Company.

Quoting from the Engineers' joint report of October 8, 1913:

"We find from the best information now obtainable that on or about August or September, 1895, this monument was removed from its original position by Mr. A. B. Proal, at that time engineer for the Richmond Light and Railroad Company, and reset about 23 or 26 feet northerly in line, or range, with its original position and the Tide Water Oil Company's chimney on Constables Hook, Bayonne, N. J., by means of a survey made for the purpose by Mr. William MacDonald; also that its position as thus moved and reset was subsequently recorded in Mr. John C. Payne's field book as 19.2 feet northerly from the northeasterly corner of the brick pump room of the power plant of the Richmond Light and Railroad Company, at Livingston, S. I., and 0.5 foot westerly from the easterly side, or line, of said brick pump room produced northerly.

"This monument was found to be leaning badly to the west. Hence, on September 12, 1913, it was carefully reset in concrete in its recorded position as above."

This monument is between the two main tracks of the Staten

Island Rapid Transit Railway and its top is about level with the top of ties of west-bound track. It has its corners and edges worn; otherwise in good condition.

Monument No. 54

This monument is located at New Brighton, S. I., on land of Sailors' Snug Harbor. This monument is about on line with the fronts of houses A, B, C, D and E, and in front of the Randall Memorial church. It is also 45.0 feet southeast of the southeast side of the marble fountain. This monument leans a trifle to the south and west and has three of its corners slightly chipped; otherwise in good condition.

Monument No. 55

This monument is at New Brighton, S. I. It is in the roadway of Richmond terrace, 6.5 feet south of north curb and about 165 east of east line of Westervelt avenue and within the west-bound trolley track. It is two inches below the surface of the roadway and is protected by a hinged iron cap. It may be readily located by measuring 7.15 feet west of the easterly side, or line, produced of the main frame building occupied by Richmond Council No. 351, Knights of Columbus (street No. 404), and by measuring 90.55 feet easterly from the southeast corner of brick building No. 421 Richmond terrace. This monument has its top corners and edges worn; otherwise in good condition.

Monument No. 56

This monument is located at St. George, S. I., on land of the B. & O. R. R. Co., at westerly end of yard and near base of steep slope to Richmond terrace. Quoting from the N. Y. State Engineer and Surveyor's report of 1900: "Monument No. 56 is at St. George, Staten Island, on the property of the B. & O. railroad at west end of yard, four feet from foot of terrace, 94 feet east of culvert, 1 foot from rail and 105 feet east of east end of wall at foot of terrace. This monument has its north and south sides broken."

As monument No. 56-A takes the place of this monument, no attempt was made to find monument No. 56.

Monument No. 56-A

Quoting from the Engineers' joint report of October 8, 1913:

" Mr. John C. Payne, secretary and engineer of the Riparian Commission of New Jersey, informs us that on September 3, 1904, this monument (granite) was carefully set in line, or range, with monument No. 56 and the Crude Oil Company's chimney on Constables Hook, Bayonne, N. J., and that its location was near the northerly side of Jay street, about opposite the junction of Stuyvesant place at St. George, S. I.

" In constructing the retaining wall along the northerly side of Jay street, the borough authorities, after first carefully noting the position of the above monument, removed it. After the retaining wall was completed and on or about September 25, 1912, the said borough authorities carefully set or caused to be set a brass bolt in the northerly concrete sidewalk of Jay street to mark the identical position of the former stone monument, which was removed as above.

" The present monument, No. 56-A, is therefore a brass bolt set in the northerly concrete sidewalk of Jay street about opposite the junction of Stuyvesant place, at St. George, S. I. It is 0.485 foot southerly from a drill hole and cut in the top of the coping of the retaining wall of Jay street."

This brass bolt is at the second lamp-post east of the west end of retaining wall; also it is 70.2 feet easterly from a drill hole and cut in the northerly curb of Richmond terrace. (Jay street is now Richmond terrace.)

This brass bolt was found to be in good condition.

MONUMENTS ON LANDS FROM HUDSON RIVER TO DELAWARE RIVER

A detailed description follows of the location and condition of the monuments marking that part of the New York and New Jersey boundary line extending from the Hudson river to the Delaware river.

Eastern Terminal Monument

The monument at the eastern terminus of the line is a large block of trap-rock, seven feet six inches long, three feet two inches high and about four feet thick. It is located at the foot of the Palisades, about six inches above storm tides of the Hudson river and about sixty feet west of the present shore line of the river. It is marked with a groove upon its perpendicular eastern face for its full heighth at a distance of two feet south from its northerly end and is further marked with the words "Latitude 41 degrees north" and on the north side of the groove the words "New York" and on the south side thereof the words "New Jersey," which last four quoted words are now covered by the cement masonry to hold in position a large pole, about eight inches in diameter and about thirty feet high, located about two inches easterly from the easterly face of the stone. Near the top of the pole and securely fastened thereto, there is a sign board about eighteen inchs wide by about five feet long, upon the easterly side of which appears the words, "State Line" and the letters, "N. J." and "N. Y." It lies 313.21 feet south 18° 44′ west from the U. S. Coast Survey station Duer, and, from the determinations of that survey, it is in latitude 40° 59′ 48.17″ north, longitude 73° 54′ 11″ west from Greenwich.

Eastern Witness, or Reference, Monument

This monument is 488 feet from the terminal monument on the bank of the Hudson river and is 350 feet above tide level. It stands opposite a point on the New York Central railroad about midway between Dobbs Ferry and Hastings and the boundary line, if extended across the Hudson, would cross the railroad near the tall, old chimney south of Hastings. By clearing away bushes in its immediate vicinity the monument would be in plain sight of the east bank of the Hudson from near Ossining almost to Yonkers. The monument is in one piece, eleven and a half feet long with a cross-section of somewhat over one by two feet. It weighs nearly three tons and is set four feet down in an accurately cut hole in the rock and fastened with cement mortar and is further supported for a foot and a half more by building stones and hydraulic mortar around it. The remaining portion (six feet) is hammered, dressed, polished and marked on two of its sides.

The north side is marked:	The south side is marked:
NEW YORK	NEW JERSEY
BOUNDARY MONUMENT	BOUNDARY MONUMENT
1882	1882
Henry R. Pierson, Chauncey M. Depew, Elias W. Leavenworth, Commissioners.	Abraham Browning, Thomas N. McCarter, George H. Cook, Commissioners.
488 FEET WEST FROM STATION ROCK H. W. CLARKE SURVEYOR.	488 FEET WEST FROM STATION ROCK E. A. BOWSER SURVEYOR.

This monument stands on the property of the Palisades Inter-State Park and aside from having all of its corners chipped it is in excellent condition. There is a vertical groove cut on the east and west ends of base of monument.

Monument No. 1, or Road Monument No. 1 between the Eastern Witness, or Reference, Monument and Milestone I

This monument is situated on the west side of the boulevard which leads from Alpine, N. J., to the village of Palisades, N. Y. It is at the east foot of the hill which rises about 15 degrees to its summit, distant about 100 paces, and is about 2,728 feet east of mile stone I. At the monument the following bearing and distance were taken: S 51° E, 5 feet 1½ inches to a whitewood tree. Soil sandy. Disk set in lime obtained from an old house. This monument was found to be in good condition except that all four corners were slightly chipped.

Monument No. 2, or Milestone I

This monument consists of two stones, the old original brownstone monument and the new granite monument, set east of and adjacent to the old one. It is situated on the west slope of a ridge between the boulevard and the road from Closter to Palisades. It is about 971 feet east of the monument No. 3 and stands on land belonging to Jacob S. Moore, 23 paces north of a rail fence running

up over the ridge. At the monument the following bearings and distances were taken: S 85° W, 18 paces to a large oak, and S 72° W, 14 paces to another. Soil sandy. Disk set in leaves. This monument was found to be in good condition except that the northerly and southerly corners were chipped.

Monument No. 3, or Road Monument No. 1 between Milestones I and II

This monument is situated on the west side of the road which leads from Closter to Palisades and is about 971 feet west of milestone I. At the monument the following bearing and distance were taken: N 50° E, 30 paces to a large black oak which stands on the west side of the road and just in front of David Munson's house. Soil sandy for a depth of three feet, when solid rock was encountered. Disk set in wood ashes. This monument was found to be in good condition except that the corners were slightly chipped.

Monument No. 4, or Road Monument No. 2 between Milestones I and II

This monument is situated on the west side of a road leading from Closter to Sparkill and is about 2,992 feet west of milestone I and on ground sloping gently westward. At the monument the following bearing was taken: north by west 5 feet to a shade maple. Soil sandy. Disk set in wood ashes. This monument leans very slightly to the north and has its corners chipped; otherwise it is in good condition. There is a sign on a maple tree near this stone marked { "State Line
N. Y. N. J."

Monument No. 5, or Milestone II

This monument is situated in the Tappan timber swamp, on land of Joseph Leival, and is about 2,304 feet west of monument No. 4, on ground which is low all around and at times covered with water. At the monument the following bearing and distance were taken: About N 45° W, 25 paces to a marble monument four inches square the corner of McCreary in Leival's line. Soil clayey. Disk set in wood ashes. This monument (both stones) was found to be in

good condition in every respect. The granite stone is one foot square.

Monument No. 6, or Railroad Monument No. 1 between Milestones II and III, on Northern Railroad of New Jersey

This monument is level with the surface of the ballast of the road-bed of the Northern Railroad of New Jersey, 2 feet 11 inches west of the westerly rail and 104 feet 4 inches southerly from the center (at the westerly end) of the center pier of the railroad bridge over small stream, Sparkill; it is also 1,501 feet west of milestone II and 327 paces southeast of Tappan station. This stone is one foot square and in good condition. Westerly corners slightly chipped. Disk set in ashes from the railroad and 15 inches below the bottom of the stones.

Monument No. 7, or Road Monument No. 1 between Milestones II and III

This monument is situated on the west side of the road leading from Norwood to Tappan, on land of William Rogers, and is about 2,904 feet west of milestone II and 130 paces north of the highway bridge over Sparkill creek. At the monument the following bearing and distance were taken: N 30° E, 75 paces to the southwest corner of a barn which stands just east of the road. Soil sandy. Disk set in wood ashes. This monument was found to be in good condition except that the corners were slightly chipped.

Monument No. 8, or Road Monument No. 2 between Milestones II and III

This monument is situated on the east side of the road leading from Schraelenburgh to Tappan, about 4,400 feet west of milestone II and on ground rising gently northwest. At the monument the following bearings and distances were taken: North 76 paces to the southeast corner of the Dutch Methodist church standing just east of the road; about north 48 paces to the front entrance of Wilson's yard, also about 10 feet northerly to a cedar tree standing on the same side of the road. Soil sandy and somewhat stony. Disk set in wood ashes. This monument has its corners and edges badly chipped; otherwise it was found to be in good condition.

Monument No. 9, or Railroad Monument No. 2 (West Shore Railroad) between Milestones II and III

This monument is situated between the two westerly tracks of the West Shore railroad and 45 paces S 20° W of Andre avenue. At the monument the following bearing and distance were taken: N 50° W, 67 paces to monument No. 10. Soil sandy. Disk set in wood ashes. This monument is level with the subgrade, 6 inches square, and has all four corners and edges badly chipped; otherwise it was found to be in good condition.

Monument No. 10, or Road Monument No. 8 (Andre Avenue) between Milestones II and III

This monument is situated on the east side of Andre avenue in front of land of Mrs. Ellen Watson. It is about 5,051 feet west of milestone II and is 13 paces south of the westerly fence of the avenue and on the east slope of the hill. At the monument the following bearing and distance were taken: N 10° W, 30 paces to the middle house of three which stand just north of the road, or avenue. Soil sandy. Disk set in wood ashes. This monument has its easterly corner slightly chipped; otherwise in good condition.

Monument No. 11, or Milestone III

This monument is situated on the east slope of Andre hill, property of Mrs. Ellen Watson, about 584 feet from the summit or about half-way up. At the monument the following bearings and distances were taken: S 40° E, 36 paces to the southwest corner of a little white house, and S 70° W, 18 paces to an old well. Soil of fine gravel. Disk set in wood ashes. This monument (both stones) was found to be in good condition except that the new stone has its southeasterly corner chipped and the old stone leans a trifle to the south.

Monument No. 12, or Road Monument No. 1 between Milestones III and IV

This monument is situated on the top of Andre hill, about 584 feet west of milestone III, on land of Mrs. Ellen Watson. At the monument the following bearings and distances were taken: South 19 paces to the northeast corner of Mrs. Watson's house and N 15°

E, 52 paces to the Andre monument. Disk set in wood ashes. This monument was slightly chipped on its four corners; otherwise it was found to be in good condition.

Monument No. 13, or Road Monument No. 2 between Milestone III and IV

This monument is situated on the north side of the road leading from Tappan to Rivervale, about 1,825 feet west of milestone III and on ground comparatively level. It is 24 paces northwesterly of a small culvert which is the beginning point of two road districts and 20 paces easterly of the entrance into Joseph Mack's barn-yard. At the monument the following bearing was taken: N 51° W to Mack's house. Soil sandy. Disk set in cinders. This monument was found to be in good condition in every respect.

Monument No. 14, or Milestone IV

This monument is on land of Chas. Smith. At the monument the following bearings and distances were taken: N 20° E, 3 feet to a cedar stump; N 10° W, 15 feet to clump of white birches, and N 10° W, 22 paces to a large whitewood tree standing in line with the stone wall marking the southeasterly side of a woods road leading northeasterly from the main road, which runs from West Norwood, N. J., to Orangeburg, N. Y., and distant about 800 feet northeasterly therefrom. The said woods road leaves the main road about 230 feet southeasterly of the old Duryea house. Soil sandy. Disk set in sand and monument in cement. This monument (both stones) was found to be in good condition in every respect. This territory is starting to grow up in brush.

Monument No. 15, or Road Monument No. 1 between Milestones IV and V

This monument is situated on the east side of a road leading from Rivervale to Orangeburg and running about north and south. It is about 2,419 feet west of milestone IV, eight paces west of fence on east side of road and 12 paces south of a small terra-cotta pipe culvert and on level ground. At the monument the following bearing and distance were taken: N 10° E, 111 paces to an old stone house owned by Oscar Dreisbach. Soil

somewhat gravelly. Disk set in light-colored sand. This monument is covered by 6 inches of road material and was not found.

Monument No. 16, or Milestone V

This monument is situated in the woods about 50 paces west of a large cultivated field now owned by Broadacre Dairy Farms and south of cleared waste field containing many cedars, opposite a point about 200 feet northerly from the southwest corner of said cleared lot and about half-way up the slope of a slight rise. It is also 5,261.27 feet west of milestone IV and 40 paces west of an old woods road running north and south. It is 140 paces south of the junction of this road with a road across meadow, leading westerly from house formerly occupied by James Cassidy and now owned by Wilder, Erwen and Patterson. At the monument the following bearing and distance were taken: S 5° E, 4 feet to an oak stump. Soil sandy. Disk set in leaves. This monument (both stones) was found to be in good condition except that the southeast corner of granite stone was slightly chipped.

Monument No. 17, or Road Monument No. 1 between Milestones V and VI

This monument, reset in concrete July 9, 1913, is situated on the west side of a road running northeasterly and southwesterly and leading to Blue Hill. It is also about 4,298 feet west of milestone V and 68 paces south of the bridge. At the monument the following bearing and distance were taken: N 80° E, 138 paces to a large locust tree standing in Mr. Priest's front yard. Soil wet and gravelly. Disk set in wood ashes. This monument has three of its corners slightly chipped; otherwise in good condition.

Monument No. 18, or Milestone VI

This monument is situated on the east slope of the hill, about 200 feet within the wood-lot, now partly cleared, belonging to Mr. Curtis (Doriskill farm). It is 5,225.18 feet west of milestone V. At the monument the following bearings and distances were taken: S 51° E, 7 feet to an elm or whitewood tree, and N 10° W, 4 paces to a maple. Soil sandy. Disk set in sand. This monument (both stones) was found to be in good condition in every respect.

Monument No. 19, or Road Monument No. 1 between Milestones VI and VII

This monument is situated on the west side of a road running S 75° E and N 75° W and is about 3,408 feet west of milestone VI and 13 paces north of an eighteen-inch ash tree on the westerly side of the road. At the monument the following bearings and distances were taken: S 70° E, 12 paces to a maple which stands between the east edge of the road and the stone fence; N 30° E, 55 paces to a thorny locust tree which stands in the front yard of W. Comes, and 7 paces south of concrete road post. Soil sandy. Disk set in wood ashes. This monument was found to be in good condition, except that two of its corners were slightly chipped.

Monument No. 20, or Milestone VII

This monument is situated very near the summit of the first ridge west of the road in an open field on the land of C. W. Dutcher and is about 5,241 feet west of milstone VI and 1,833 feet west of monument No. 19; also 13 paces easterly from the westerly stone wall fence of the field; also the line crosses the stone wall fence between the open field and the woods at a distance of about 130 paces northerly along the same from the lane. Soil sandy. Disk set in sand and monument in cement. The old brownstone monument is broken and split. The new monument was found to be in good condition, but loose, and should be reset in concrete.

Monument No. 21, or Railroad Monument No. 1 between Milestones VII and VIII, on the New Jersey and New York Railroad

This monument, 12 inches by 12 inches, is situated on the west side of the track of the New Jersey and New York railroad, close in by the end of the ties, about 1,640 feet west of milestone VII, about 880 paces along the track from the southeast corner of the depot at Pearl River, and in a slight cut. This monument was found to be in good condition, except that its westerly corners were slightly chipped. There is a sign-post on the west side of the cut, 3 inches by 12 inches by 10 feet high, marked "N. Y. N. J."

Monument No. 22, or Road Monument No. 1 between Milestones VII and VIII

This monument is situated on the west side of a road leading from Mount Vale to Pearl River and running about north and south, at the east foot of the hill, about 2,063 feet west of milestone VII and 385 feet west of monument No. 21, also about six feet north of the corner of a line fence running about N 51° W up over the hill. Soil sandy. Disk set in wood ashes. This monument was found to be in good condition, except that the easterly corners were slightly chipped.

Monument No. 23, or Milestone VIII

This monument is situated in an open field belonging to Mrs. Laura B. Hollis, on slightly rolling ground, about 5,251.25 feet west of milestone VII and about 25 paces west of the nearest point of the Pascack creek. At the monument the following bearing and distance were taken: Due west 15 paces to an apple tree. Soil sandy. Disk set in sand and the monument in cement. This monument, small one, is on a sloping hillside, leans badly to the southeast and should be reset in concrete. The old stone leans badly to the north.

Monument No. 24, or Road Monument No. 1 between Milestones VIII and IX

This monument, reset in concrete July 9, 1913, is situated on the east side of the road which runs north and south and is about 449 feet west of milestone VIII, about 10 feet north of a small stream on grounds sloping eastward and about 5 feet north of parapet wall of culvert. Soil very gravelly and the hole full of water. Disk set in wood ashes. This monument was found to be in good condition in every respect.

Monument No. 25, or Road Monument No. 2 between Milestones VIII and IX

This monument, moved October 10, 1910, and reset July 11, 1913, is situated on the north side of the road from Pearl River to Saddle River running nearly east and west, just at the top of a hill and about 2,320 feet west of milestone VIII. At the

monument the following bearings and distances were taken: South 9 paces to a chestnut tree, now dead, on opposite side of the road, and due west about 6 feet to a white oak tree. Soil sandy. Disk set in sand. This monument was found to be in good condition except that its corners and edges were slightly chipped.

Monument No. 26, or Road Monument No. 3 between Milestones VIII and IX

This monument is situated on the west side of the road, about 3,492 feet west of milestone VIII and nearly opposite the point at which a road running north and south enters the main road on which the monument is set. The main road runs from Nanuet to Saddle River and the cross road to Pearl River. At the monument the following bearings and distances were taken: S 50° E, 22 paces to a small white oak standing just inside the fence and at the intersection of the roads, and N 51° W, about 400 feet to the house at top of hill. Soil somewhat gravelly. Disk set in wood ashes. This monument was found to be in good condition in every respect.

Monument No. 27, or Road Monument No. 4 between Milestones VIII and IX

This monument is situated on the west side of the road which runs about north and south, leading from Hackensack to Spring Valley, and is about 109.5 feet east of milestone IX and on level ground. Soil sandy. Disk set in wood ashes. This monument has its southerly edge slightly chipped; otherwise in good condition in every respect.

Monument No. 28, or Milestone IX

This monument is situated in a young orchard on the property of Mr. Post and on level ground. At the monument the following bearing and distance were taken: N 51° W, 115 paces to Post's house. Soil sandy. Disk set in sand and monument in cement. This monument (both stones) was found to be in good condition except that the old stone leans easterly and southerly. As this ground is regularly plowed, this monument should be set in concrete.

Monument No. 29, or Road Monument No. 1 between Milestones IX and X

This monument is situated on the west side of the road running about north and south, and is about 318 feet east of milestone X and on level ground. At the monument the following bearings and distances were taken: S 20° W, 55 paces to the northeast corner of John Foxlee's house, and N 32° E, 80 paces to the northeast corner of J. A. Christopher's house. Soil sandy. Disk set in wood ashes. This monument has its northerly edge slightly chipped; otherwise in good condition.

Monument No. 30, or Milestone X

This monument is situated about one foot north of a line fence between lands of John Foxlee and J. A. Christopher, just a little on the westerly slope of a slight rise and is about 5,286.6 feet west of milestone IX. At the monument the following bearings and distances were taken: S. 26° E, 135 paces to the northwest corner of Foxlee's house, and S. 78° W, 92 paces to a chestnut tree. Soil sandy. Disk set in sand and monument in cement. This monument (both stones) was found to be in good condition, except that the northerly corners of granite monument were slightly chipped.

Monument No. 31, or Road Monument No. 1 between Milestones X and XI

This monument is situated on the east side of a road leading from Saddle River and running S 20° W and N 20° E. It is about 4,050 feet west of milestone X and on ground sloping gently westward toward Saddle River. At the monument the following bearing and distance were taken: N 11° W, 37 paces to the southeast corner of foundation of Michael Connolly's barn, recently burned. Soil gravelly and sandy and hole very wet. Disk set in wood ashes. This monument was found to be in good condition in every respect.

Monument No. 32, or Milestone XI

This monument is situated in a rock pile in an open lot belonging to M. T. Connolly and is 5,267.6 feet west of milestone X and about 1,217 feet west of monument No. 31, on ground ascending

westward, 11 paces from the wire fence separating apple orchard from open lot and 45 paces easterly from a small shed. Soil sandy and somewhat stony. Disk set in sand. This monument, small one, was found to be in good condition. The old stone leans southerly. Brush is starting to grow around these monuments and obscures them when foliage is out.

Monument No. 33, or Road Monument No. 1 between Milestones XI and XII

This monument is situated on the north side of the road which runs N 75° W and S 75° E, opposite an apple tree standing on the south side of the road. It is about 2,258 feet west of milestone XI and on the west slope of a hill, near the top. At the monument the following bearings and distances were taken: N 75° W, 20 feet to a large chestnut, now dead, standing on the north side of the road, and S 84° E, 32 paces (passing a wall at 7 paces) to the southwest corner of Morris Solperstein's house, which stands north of the road and about at the top of the hill. Soil sandy. Disk set in wood ashes. This monument was found to be in good condition, except that both easterly corners were slightly chipped.

Monument No. 34, or Road Monument No. 2 between Milestones XI and XII

This monument is situated on the east side of a road which runs northeast and southwest and is 3,585 feet west of milestone XI and about at the foot of the hill adjoining lands of Margaret DeBarry. At the monument the following bearing and distances were taken: N 25° E, 25 paces to a buttonwood tree, which stands near a bridge and on the east bank of the stream; also 20 feet to the center of said stream. Soil sandy. Disk set in wood ashes. This monument was found to be in good condition except that three of its corners were slightly chipped.

Monument No. 35, or Road Monument No. 3 between Milestones XI and XII

This monument is situated on the west side of the River Valley road, which runs about north and south, and is about 4,083 feet

west of milestone XI. At the monument the following bearing and distances were taken: S 10° E, 31 paces along the road to a barn on the east side; 8 paces north of terra cotta pipe culvert set in concrete. Soil sandy. Disk set in wood ashes. This monument was found to be in good condition except that the southeast corner was slightly chipped.

Monument No. 36, or Milestone XII

This monument is situated in the wood-lot (about 60 feet west of easterly edge) belonging to Cornelius Snyder at the west foot of the hill and is about 25 paces N 51° W from the corner of the line fence which ends at the woods and 17 paces south of fence running east and west through the woods. At the monument the following bearing and distance were taken: North 16 paces to a hickory tree standing near a fence running east and west. Soil sandy. Disk set in sand. This monument (both stones) was found to be in good condition in every respect, except old stones broken on New Jersey face.

Monument No. 37, or Road Monument No. 1 between Milestones XII and XIII

This monument is situated at the top of a hill and on the east side of a road running north and south from Saddle River to Tallmans and is about 3,304 feet west of milestone XII. At the monument the following bearing and distances were taken: S 53° E, 12 paces to the northwest corner of H. Ackerson's house. Soil sandy. Disk set in wood ashes. This monument was found to be in good condition, except that the southeast corner was slightly chipped.

Monument No. 38, or Milestone XIII

This monument is situated on the west slope of a hill in an open field, the property of Louis H. Doremus, and 5,297 feet west of milestone XII. It is 16 paces east of west fence, 20 paces north of south fence and 50 paces east of Doremus' lane. Soil sandy. Disk set in sand and monument in cement. This monument, small one, has its southerly corners rounded; otherwise in good condition in every respect. Old, or large, stone leans slightly to the south.

Monument No. 39, or Road Monument No. 1 between Milestones XIII and XIV

This monument is situated at the east side of a road running N 40° E and S 40° W and is about 673 feet west of milestone XIII. At the monument the following bearing and distance were taken: S 18° E, 15 paces to the northwest corner of Louis H. Doremus' house. Soil coarse gravel. Disk set in wood ashes. This monument leans westerly and has its westerly corners chipped.

Monument No. 40, or Road Monument No. 2 between Milestone XIII and XIV

This monument is situated at about the east foot of a hill and on the west side of a road which runs N 20° E and S 20° W and is about 2,782 feet west of milestone XIII. At the monument the following bearing and distance were taken: About N 37° E, 30 paces to the southwest corner Geo. Dunlop's house. This monument is in the westerly prolongation of a line fence on the easterly side of the road between land of G. W. Suterland and Geo. Dunlop. Soil sandy. Disk set in wood ashes. This monument has its corners chipped; otherwise in good condition in every respect.

Monument No. 41, or Milestone No. XIV

This monument is situated near the edge of the woods on the west slope of the hill and is 5,298 feet west of milestone XIII. At the monument the following bearing and distances were taken: S 42° E, 9 paces to a white oak stump; also about one-half mile west of W. H. Way's house and at the corner of Melvin Brown's land and Christie's and Geo. and A. Fox's land, Brown's fence running westerly and Fox's running northerly. Also about 144 paces north of tower No. 149 of power line. Soil sandy. Disk set in sand. This monument (both stones) was found to be in good condition in every respect.

Monument No. 42, or Road Monument No. 1 between Milestones XIV and XV

This monument is situated on the south side of the private road, or lane, leading up to the "Foxwood Inn" and is 3,343 feet west of milestone XIV and on level ground, outside of wire fence. At the monument the following bearing and distances were taken:

N 85° W, 5 paces to a shade maple. Soil sandy. Disk set in sand. Monument, being broken in the middle, was set in cement. This monument was found to be in good condition except the northwest corner and edges slightly chipped.

Monument No. 43, or Road Monument No. 2 between Milestones XIV and XV

Quoting from the State Engineer's report of 1896:

"This monument is situated on the east side of the old Ramapo post road, which runs about north and south, and is about 4,705 feet west of milestone 'XIV.' At the monument the following bearing was taken: South 215 paces to the bridge over the Mahwah river; . . . Soil sandy. Disk set in ashes from the railroad. This monument is slightly chipped, otherwise it was found to be in good condition."

It is about one foot below present surface of road; 48.55 feet northeasterly from extreme corner of northerly wing wall; 110 feet northeasterly from extreme corner of southerly wing wall of undergrade highway crossing, Erie railroad; 15.63 feet northwest from pole and 5.85 feet east of gage line of electric railway. This monument is now covered by a concrete sidewalk, hence no attempt was made to uncover it. New monument should be set at a suitable point.

Monument No. 44, or Railroad Monument No. 1 between Milestones XIV and XV, on the New York, Lake Erie & Western Railroad

This monument, six inches by six inches square, of granite, is situated between tracks numbered three and four of the Erie railroad at Suffern, N. Y., 6.8 feet east of easterly rail of track No. 4, 1.6 feet west of westerly rail of track No. 3 and 1.2 feet below top of tie. It is about 124.25 feet westerly from monument No. 43 and 4,839 feet west of milestone XIV. It is 138.06 feet northerly from the easterly corner and 138.82 feet northerly from the westerly corner of back wall of railroad bridge over highway. This monument is under the road-bed and should be raised to grade.

Monument No. 44-A, or Road Monument No. 3 between Milestones XIV and XV

This monument, 12 inches by 12 inches, marked by cross 8 inches long, thus $\frac{\text{N} \mid \text{Y}}{\text{N} \mid \text{J}}$ is situated on the easterly side of Ramapo avenue, 39.95 feet southeasterly from milestone XV. This monument was found to be in good condition.

Monument No. 45, or Milestone XV

This monument is situated near the center of Ramapo avenue, 39.95 feet from monument No. 44-A, and 5,280 feet west of milestone XIV. At the monument the following bearing and distance were taken: N 50° E, about 75 paces to Zabriskie's house. Soil sandy. Disk set in sand and monument in cement. This monument (both stones) is about one foot below the present bituminous macadam road surface, hence no attempt was made to uncover it.

Monument No. 46, or Road Monument No. 1 between Milestones XV and XVI

This monument is situated on the east side of the road which runs north and south along the east foot of the Ramapo mountains. At the monument the following bearing was taken: 2 feet west of small hickory standing opposite the end of a line fence. Soil sandy. Disk set in wood ashes. This monument has its corners chipped, the easterly ones badly; otherwise in good condition.

Monument No. 47, or Milestone XVI

This monument, granite, 12 inches square, is situated about half-way up the east slope of the Ramapo mountain and 10 feet east of a woods road, which leaves the main road nearly opposite monument No. 46. It is about 10,463 feet west of milestone XIV and about 200 feet westerly on line from the site of Peter Mann's cabin. At the monument the following bearing was taken: N 65° E to the spire of the Episcopal church in Suffern. Soil sandy to within about six inches of the full depth, when a rock ledge was encountered, on which was cut a cross in place of the disk. This monument was found to be in good condition in every respect.

Monument No. 48, or Milestone XVII

This monument is situated on the east slope of a ridge, about 26 paces southeast from the road leading past William DeGrott's house, and is 5,141.65 feet west of milestone XVI. At the monument the following bearings and distances were taken: About S 53° E, 12 feet to a red oak tree, and N 10° E, 8 paces to a black oak tree. Soil very rocky. Disk set in sand. This monument (both stones) was found to be in good condition except that new stone has its southeast corner badly chipped. The old stone is an undressed brownstone slab. The State line in this vicinity has recently been cut through.

Monument No. 49, or Milestone XVIII

This monument is situated in an open field belonging to the Pierson estate and about half-way down a gradual slope, which begins at the mountain on the southeast and slopes westward. It is 5,301.2 feet west of milestone XVII. At the monument the following bearing and distances were taken: N 85° E, 9 paces to a round top maple, also about 87 paces northerly to John Mann's house. Soil gravelly. Disk set in wood ashes. This monument (new stone) was found to be in good condition. Old stone is a small brownstone slab, not embedded, and leans northwardly.

Monument No. 50, or Road Monument No. 1 between Milestones XVIII and XIX

This monument is situated on the east side of a road running N 30° E and S 30° W, 156 paces southwest along said road from the center of a culvert. It is 197 paces from fork in road leading up the hill. The monument is about 8 paces north of a large boulder, which is about 12 feet long, 6 feet high and 10 feet wide. Soil sandy. Disk set in leaves. This monument leans northerly and projects more than usual; otherwise in good condition.

Monument No. 51, or Milestone XIX

This monument is situated in the woods, very near the top of the ridge between Negro and Shepherd ponds, on land belonging to the Pierson estate, and 60 paces from monument No. 52. At the monument the following bearing and distance were taken:

N 75° W, 3 feet to a small white oak, blazed. Soil sandy to within about six inches of the required depth, where a ledge of rock was encountered, on which a mark was cut in place of the disk. This monument (new one) has its southeast corner slightly chipped; otherwise in good condition. The old stone is an irregular traprock slab.

Monument No. 52, or Road Monument No. 1 between Milestones XIX and XX

This monument is situated in the woods, about 60 paces west of milestone XIX and a little on the west slope of the ridge and on the east side of the road which runs N 20° E and S 20° W, and is about 180 paces southerly along the private road leading to F. L. Stetson's house from the main road, leaving the latter at the gate to William Hamilton's. At the monument the following bearings were taken: East 2 paces to a clump of three chestnut trees, and west 5 paces to another. Soil fine sand. Disk set in leaves. This monument has three of its corners chipped; otherwise in good condition. It should be moved to the new road near-by, as this road is abandoned.

Monument No. 53, or Road Monument No. 2 between Milestones XIX and XX

This monument is situated near the top of the first hill west of Shepherd pond and on the east side of the old road running N 20° E and S 20° W which now terminates at a worm line fence about 1,800 feet from the main road. It is about 4,023 feet west of milestone XIX and on south side of worm fence. At the monument the following bearing was taken: N 85° E to Hamilton's concrete house. Soil sandy. Disk set in wood ashes. This monument has its northeast corner slightly chipped; otherwise in good condition. It should be moved to the new road near-by, as this old road is abandoned.

Monument No. 54, or Milestone XX

This monument is situated in a wet meadow, about 170 feet west of the west edge of the woods which skirts the meadow, and is 5,227.4 feet west of milestone XIX and in a line between the

lands now or formerly of Abram S. Hewitt and Colonel Payne, and southeast of a clump of bushes. At the monument the following bearing and distance were taken: S 58° E, 42 paces to a large white oak. Soil about two feet turf, two feet blue clay and the balance good solid sandy gravel; hole filled with water, but the monument is firmly set in cement and the disk put in as usual. This monument (new one) has its easterly corners slightly chipped; otherwise in good condition. The old stone is an irregular sandstone slab. This monument may be readily found by following the line fence westerly from monument No. 53.

Monument No. 55, or Road Monument No. 1 between Milestones XX and XXI

This monument is situated in the valley on the west side of a road which runs N 45° E and S 45° W. It is about 2,544 feet west of milestone XX and 5 paces north of a small culvert. At the monument the following bearing and distance were taken: N 65° E, 60 paces to the southeast corner of a frame house painted red. Soil gravelly and many boulders; hole filled with water. Disk set in wood ashes. This monument has its corners slightly chipped; otherwise in good condition.

Monument No. 56, or Milestone XXI

This monument is situated on the west slope of a high ridge. At the monument the following bearing and distance were taken: S 51° E, 4 paces to a white ash tree about 18 inches in diameter standing on line. Soil sandy. Disk set in leaves. This monument (new one) was found to be in good condition. The old one is an irregular granite slab.

To reach this monument take old woods road, Sterling Furnace to Ringwood, over the fence bars, past deserted house, over the bars again and around the hill.

Monument No. 57, or Road Monument No. 1 between Milestones XXI and XXII

This monument is situated on the west slope of the mountain, on the east side of a woods road from Ringwood to Sterling Furnace, which runs S 85° E and N 85° W, and about 80 paces west

of milestone XXI. At the monument the following bearings and distances were taken: N 85° W, 7 paces to a white oak tree standing on the west side of the road, and N 60° E, 7 paces to a chestnut tree on the easterly side of the road. Soil sandy. Monument was broken in getting it to the place and in consequence was only set about two feet, but very firmly. This monument has three of its corners slightly chipped; otherwise in good condition.

Monument No. 58, or Milestone XXII

This monument is situated in the woods on the southeast slope of a hill which appears to be a projection from the Black Rock mountain. It is 5,258.46 feet west of milestone XXI and just on the southeast edge of a ledge of rocks. At the monument the following bearings and distances were taken: N 53° W, about 200 paces to the large boulder which caps the south end of Black Rock Mountain; S 48° E, about 4 paces to a small rock oak, and S 32° E, 16 paces to twin white oaks 10 inches in diameter, which separate about two feet above ground. Very rocky all about and in consequence a mark was cut in place of disk. This monument (new one) is chipped on the westerly edge; otherwise in good condition. The old one is an irregular granite slab the top of which is painted red.

The line has recently been cut and painted white; otherwise the monument would be difficult to find.

Monument No. 59, or Road Monument No. 1 between Milestones XXII and XXIII

This monument is situated in the valley between Black Rock and Beech mountains. It is about 4,012 feet west of milestone XXII and on the south side of a road which runs S 80° E. This monument is about 14 paces east of a small culvert. Solid rock was encountered and no disk used. This monument has its northeast and northwest corners slightly chipped; otherwise in good condition.

Monument No. 60, or Milestone XXIII

This monument is situated in a swamp, but on ground somewhat higher, about at the foot of Beech mountain, in thick woods, on land of F. K. Curtis. At the monument the following bearings

and distances were taken: S 20° W, about 1,000 feet to the house formerly of William Patterson on Beech farm, and S 24° E, 25 paces to a large red oak. It is 4,586 feet west of milestone XXII and at the foot of two birch trees. Soil sandy. Disk set in leaves. This monument leans slightly to the northwest; otherwise in good condition. The old monument, a small, irregular slab, is not embedded and is one of the many stones surrounding the new monument.

Monument No. 61, or Milestone XXIV

This monument is situated on the west slope of Beech mountain, about half-way down, and on the west side of a road running about north and south, which at this point runs down hill towards the north. It is also 5,197 feet west of milestone XXIII. At the monument the following bearings and distances were taken: S 67° W, 40 paces to a large chestnut, which stands just on the east edge of a woods road that leaves the main road near the monument; about 3 paces northeast to three blazed trees on the west side of the road; also N 10° W, about 50 paces to a large white oak. Soil sandy. Disk set in leaves. This monument (new one) was found to be in good condition in every respect. The old stone is an irregular slab of mountain slate.

This line has just been cut through and painted white; hence it is easy to follow.

Monument No. 62, or Milestone XXV

This monument is situated on the west slope of the first ridge east of Greenwood lake and in the northwest corner of a swamp. It is also 5,247.4 feet west of milestone XXIV. At the monument, the following bearings and distances were taken: N 55° E, 5 paces to a large oak, and S 48° E, 60 paces to a large pepperage tree. Soil clay and somewhat wet. No disk used. This monument (new one) leans southerly; otherwise in good condition. The old stone is an irregular slab of sandstone. (Line opened and marked by white paint.)

Monument No. 63, or Railroad Monument No. 1 between Milestones XXV and XXVI, on The New York & Greenwood Lake Railway

This monument is situated at the west foot of the ridge on the west side of the New York & Greenwood Lake railroad track and is about 2,525 feet west of milestone XXV and 15 paces east of the edge of Greenwood lake. At the monument the following bearings and distances were taken: N 40° E, about 21 paces to the southeast corner of porch of hotel owned by Mr. Julius Brandes of Paterson, and S 40° W, 32 paces to the northeast corner of the railroad station. Soil sandy. Disk set in ashes from the railroad. This monument, 6 inches square, leans slightly to the southeast and has its corners and edges worn in consequence of its being in the center of a traveled roadway.

Monument No. 64, or Milestone XXVI

This monument, reset in concrete July 17, 1913, is situated at the east foot of Rough mountain, 5,282 feet west of milestone XXV and southeast 16 paces from the southeast corner of the Greenwood Lake Boat and Country Club house. At the monument the following bearings and distances were taken: N 23° W, 65 paces to a large sugar maple, which stands 10 paces west of the road, and S 70° W, 50 paces to another, which stands 10 paces east of the road and 5 paces northwest of boat-house of Greenwood Lake Boat and Country Club. Soil gravelly. Disk set in sand. This monument has three of its corners and one edge chipped; otherwise in good condition.

Monument No. 65, or Road Monument No. 1 between Milestones XXVI and XXVII

This monument is situated on the west side of the road which runs N 20° E and S 20° W along the east foot of Rough mountain and is about 50 paces west of milestone XXVI. At the monument the following bearings and distances were taken: N 12° E, 38 paces to a sugar maple, and S 5° W, 45 paces to another (both of which are mentioned in the preceding description), also 760 paces southwesterly along the road to the Lake Side house. Soil quite slaty. Disk set in charcoal. This monument has its corners and edges chipped; otherwise in good condition.

Monument No. 66, or Milestone XXVII

This monument is situated on Rough mountain about 300 paces west of the last or highest ridge and on a rocky ridge about midway between two swamps, and is distant 5,047.7 feet west of milestone XXVI. At the monument the following bearings and distances were taken: South 50 paces to a pine tree at westerly edge of east swamp; N 30° E, about 100 feet to the outlet of the easterly swamp; S 60° W, 7 paces to a small pine 8 inches in diameter growing out of the ledge, and N 30° W, 15 paces to small pine at northeast edge of west swamp. Cross cut on the ledge in place of disk. This monument was found to be in good condition in every respect.

To reach this monument take road from Bellvale running southwest between Bellvale mountain and Warwick mountain to gate marked "Cascade Park," which is about half a mile west of bridge over Long House creek. Pass through gate, follow woods road past abandoned house and orchard and over corduroy bridge spanning Long House creek, and continue past signs and along barbed wire fence and beyond to narrow crossing of swamp (25 feet, more or less, wide). Turn to right, follow westerly edge of swamp to outlet, cross outlet and follow description above. This crossing is within sight of the rocky ridge east of the swamp.

Monument No. 67, or Milestone XXVIII

This monument is situated about half-way up the southerly slope of a steep hill in the woods, 1 foot north of a barbed wire fence, 100 paces north of a cleared field and is distant 5,161 feet west of milestone XXVII. At the monument the following bearings and distances were taken: S 5° E, about 11 feet to a shell bark hickory; S 40° W, to an old tumble-down house standing on the north side of the lane which leads up by O'Brien's house, and S 45° E, 20 paces to a rock oak tree on line with barbed wire fence 200 feet, more or less, northwest of meadow up the hill. This monument (new one) has its westerly corner chipped; otherwise in good condition in every respect. The old stone is an irregular mountain slab, not embedded.

To reach this monument go in the lane south of road stone 68 feet and follow northeast to wire fence.

Monument No. 68, or Road Milestone No. 1 between Milestones XXVIII and XXIX

This monument is situated on the west side of a road which runs N 20° E and S 20° W along the west slope of the ridge and is distant 1,295 feet west of milestone XXVIII. At the monument the following bearings and distances were taken: N 20° E, about 90 feet to a large chestnut standing in the stone fence; S 30° W, 7 paces to a large cherry tree, and 7 paces back along line to a twin oak on east side of road. Soil gravelly and some slate. Disk set in sand. This monument is chipped along its easterly and southerly edges and has three corners broken. It also leans slightly to the north.

Monument No. 69, or Milestone XXIX

This monument is situated about half-way down the westerly slope of a steep hill in an open field on land of Mr. Edward Wright, and is distant 5,232.8 feet west of milestone XXVIII. At the monument the following bearings and distances were taken: S 50° W, 50 paces to a large buttonwood tree, and N 19° W, 420 paces to the southeast corner of Wright's house. Soil sandy. Monument set in cement and disk in sand. This monument, new one, leans northwesterly; otherwise in good condition. The old stone is an irregular sandstone slab and lies near the new one.

Monument No. 70, or Road Monument No. 1 between Milestones XXIX and XXX

This monument, reset July 15, 1913, is situated on the west side of a road which runs N 40° E and S 40° W and is distant about 1,813 feet west of milestone XXIX and is about at the west foot of the slope. At the monument the following bearings and distances were taken: N 50° E, 240 paces to a small house standing opposite the junction of the roads, also about 40 paces southwesterly along the road to a bridge, and 18 paces southwest to Paul Mezey's new house on west side of road. Soil sandy. Disk set in wood ashes. This monument has its northeast and southwest corners chipped; otherwise in good condition.

Monument No. 71, or Milestone XXX

This monument is situated on top of a mountain and on the east slope of a ridge, about 30 paces west of an old woods road, which runs between this ridge and one a little farther east, and 33 paces southeasterly along the line to the corner of a worm line fence. It is 5,325 feet west of milestone XXIX. At the monument the follow bearing and distances were taken: N 51° W, 7 paces to a large oak stump, and southerly 3 feet to a hickory sapling standing alone. Soil sandy. Disk set in leaves. This monument (new one) was found to be in good condition in every respect. The old stone is an irregular field-stone.

Monument No. 72, or Road Monument No. 1 between Milestones XXX and XXXI

This monument is situated on the east side of a road which runs N 40° E and S 40° W through the hollow, 25 feet east of middle of the road and 15 feet east of a brook. It is distant about 1,020 feet west of milestone XXX and 5 paces easterly of the point where the brook crosses the road and at the west foot of the hill. At the monument the following bearings and distances were taken: N 68° W, 20 paces to a large hemlock; S 65° E, 13 paces to a chestnut, also 3 paces to a twin black oak. Soil sandy, but very still and hard towards the bottom. No disk used. This monument has its southeasterly corner slightly chipped; otherwise in good condition.

Monument No. 73, or Road Monument No. 2 between Milestones XXX and XXXI

This monument is situated on the east side of a road running about north and south and about at the top of a hill and is distant 2,260 feet west of milestone XXX. At the monument the following bearings and distances were taken: N 8° W, 78 paces to a large hickory, now dead, which stands just on the roadside in front of the house of John W. House, and N 53° W, 22 paces to an apple tree standing in the orchard west of the road. Soil sandy. Disk set in wood ashes. This monument has its northeast and southwest corners slightly chipped; otherwise in good condition.

Monument No. 74, or Milestone XXXI

This monument is situated in an open field on the land of Frederick Carey, on the gentle west slope of the hill and is distant 5,280 feet west of milestone XXX and 22 paces west of stone wall on west side of lane leading past Carey's barn. At the monument the following bearing and distance were taken: N 44° E, 165 paces to the southeast corner of Carey's barn. Soil sandy. Disk set in sand and monument in cement. This monument, new one, has its northwest corner slightly chipped; otherwise in good condition. The old stone is gone.

Monument No. 75, or Road Monument No. 1 between Milestones XXXI and XXXII

This monument is situated on the west side of a road running about north and south and sloping towards the north and is distant 8,629.8 feet west of milestone XXX. At the monument the following bearing and distances were taken: N 7° E, 425 paces along the road to the house of Russell Ferguson, which stands at the junction of the road, and southerly 6 paces along the road to a red oak tree. Soil sandy. Disk set in wood ashes. This monument has its northerly and easterly edges slightly chipped; otherwise in good condition.

Monument No. 76, or Road Monument No. 2 between Milestones XXXI and XXXII

This monument is situated on the north side of a road running N 78° W and S 78° E, in front of and near the easterly end of a picket fence and between two shade trees, 6 feet 9 inches west of one and 19 feet 9 inches east of the other. At the monument the following bearing and distance were taken: N 35° W, 82 paces to the northeast corner of M. L. Taylor's house. Soil sandy. Disk set in wood ashes. This monument has three of its corners slightly chipped and leans a trifle to the northwest; otherwise in good condition.

Monument No. 77, or Milestone XXXII

This monument is situated in an open field belonging to M. L. Taylor, about 3 paces south of a lane running from his house down

across the Wawayanda, and is distant 5,317 feet west of milestone XXXI. At the monument the following bearings and distances were taken: S 34° E, about 75 paces to the northwest corner of the main barn, and N 53° W, 110 paces to a large hickory which stands in an open field along the aforesaid lane. Soil sandy. Disk set in sand and monument in cement. This monument, new one, has its northwest and southeast corners slightly chipped; otherwise in good condition. The old monument is of brownstone, well preserved and in good condition.

Monument No. 78, or Railroad Monument No. 1 between Milestones XXXII and XXXIII, on Lehigh & Hudson River Railroad

This monument, reset in concrete July 15, 1913, is situated on the north side of the track of the Lehigh & Hudson River railroad and is distant about 2,367 feet west of milestone XXXII. At the monument the following bearing and distances were taken: S 88° E, 80 paces to an elm which stands in the field about 33 paces south of the track, also about 17 feet westerly along the railroad to the northerly abutment of a cattle pass; soil sandy. Disk set in ashes from the railroad. This monument, 6 inches square, has three of its corners chipped; otherwise in good condition.

Monument No. 79, or Road Monument No. 1 between Milestones XXXII and XXXIII

This monument is situated on the south side of a road running N 70° E and S 70° W, on ground comparatively level, and is distant about 4,060 feet west of milestone XXXII. At the monument the following bearing and distances were taken: N 35° W, 25 paces to a butternut tree, also 263 paces southwesterly along the road to the fork in the road. Soil slaty. Disk set in wood ashes. This monument has all of its corners and easterly and westerly edges chipped; otherwise in good condition.

Monument No. 80, or Road Monument No. 2 between Milestones XXXII and XXXIII

This monument is situated on the west side of a road which runs N 25° E and S 25° W, at the east foot of a hill, and is

distant about 4,616 feet west of milestone XXXII. At the monument the following bearings and distances were taken: N 51° W, 4 feet to a large oak tree, now dead, on line; N 60° E, 45 paces to an elm, and east 25 paces to a black walnut tree. Soil sandy with slate rock bottom. Disk set in wood ashes. This monument has its two easterly corners and southerly edge chipped; otherwise in good condition.

Monument No. 81, or Milestone XXXIII

This monument is situated on the east slope of a ridge, just on the south side of a line stone fence on the property of A. Ely, now Mrs. Fairchild, at the top of a stone ledge, and is distant 5,355 feet west of milestone XXXII. At the monument the following bearings and distances were taken: N 51° W, 5 paces to a large white oak on line, and S 51° E, 10 paces to a large black walnut near line. Monument set in rock excavation with cross cut on the bottom in place of disk. This monument (both stones) was found to be in good condition in every respect.

Monument No. 82, or Road Monument No. 1 between Milestones XXXIII and XXXIV

This monument is situated on the west side of a road running N 50° E and S 50° W, and is distant about 4,354 feet west of milestone XXXIII. At the monument the following bearings and distances were taken: S 45° E, 12 paces to an apple tree near corner of a stone fence; S 50° W, 4 feet to a wild cherry tree; also about 3 feet southwesterly to line fence. Soil sandy. Disk set in wood ashes. This monument has its easterly corners chipped; otherwise in good condition.

Monument No. 83, or Milestone XXXIV

This monument, reset in concrete July 18, 1913, is situated in an open swampy field 200 feet west of west end of line fence on land of Mr. Layton and distant 5,280 feet west of milestone XXXIII and east of Pochuck meadow. At the monument the following bearings and distances were taken: S 5° W, 250 paces to the northwest corner of Layton's house, and N 51° W, 95 paces

to a buttonwood standing on line. Disk set in fine gravel. This monument was found to be in good condition in every respect.

Monument No. 84, or Milestone XXXV

This monument, reset in concrete July 26, 1913, is situated in an open field on swampy low land about 100 paces east of the edge of the upland and the west edge of Pochuck meadow, 10 feet north of line fence, on the property of A. L. and F. L. Roy, and is distant about 5,347 feet west of milestone XXXIV. At the monument the following bearings and distance were taken: N 10° W, to Mr. Roy's house, and S 10° E, 6 paces to a pin oak tree standing on the south bank of a line brook, or ditch. This tree is not notched, or blazed. Soil soft and mushy. Disk set in sand and monument in cement. This monument (both stones) found to be in good condition in every respect except that new stone has its corners chipped.

Monument No. 85, or Road Monument No. 1 between Milestones XXXV and XXXVI

This monument is situated on the east side of a road running about at right angles to the line and on the east slope of the Pochuck mountain, about 9 feet north of line fence and 694.1 feet west of milestone XXXV. At the monument the following bearings and distances were taken: S 50° E, 43 paces to an elm tree standing in the fence, and S 24° W, 63 paces to another on the east edge of the road. Soil sandy. Disk set in sand. This monument has three of its corners chipped; otherwise in good condition.

Monument No. 86, or Milestone XXXVI

This monument is situated in an open field on the east slope of the Pochuck mountain, on the property of Daniel Bailey, and is distant 5,270 feet west of milestone XXXV. At the monument the following bearings and distances were taken: N 49° E, 40 paces to the southeast corner of the foundation of the old log house; S 64° E, 50 paces to a large willow tree; also about S 55° E, 36 paces to a black walnut tree, and N 50° E, 18 paces to an old railroad embankment. Soil sandy. Disk set in wood ashes. This monument projects a little more than usual; otherwise in good condition.

Monument No. 87, or Milestone XXXVII

This monument is situated in a ravine between two ridges of the Pochuck mountain, 30 feet north of the north edge of a swamp, on land of Jesse S. Lamareaux estate, and is distant 5,147.7 feet west of milestone XXXVI. At the monument the following bearings and distances were taken: S 51° E, 25 feet to an ash tree about 6 inches in diameter and N 75° W, 3 paces to a white oak standing about 30 feet south of the road leading to an orchard (following this road easterly about 100 paces it opens into an apple orchard). Soil sandy. Disk set in leaves. This monument (both stones) was found to be in good condition.

Monument No. 88, or Road Monument No. 1 between Milestones XXXVII and XXXVIII

This monument is situated on the westerly side of a road which runs N 43° E and S 43° W, about at the west foot of the Pochuck mountain, and is distant about 3,651 feet west of milestone XXXVII. At the monument the following bearing and distance were taken: S 46° W, 200 paces to the northeast corner of house now or formerly of Levine Potter. Soil sandy. Disk set in wood ashes. This monument has its easterly corner slightly chipped; otherwise in good condition.

Monument No. 89, or Milestone XXXVIII

This monument is situated in the meadow land east of the Wallkill river and distant 5,247.7 feet west of milestone XXXVII. At the monument the following bearing and distance were taken: N 53° W, 33 paces to a ditch running at right angles with the line fence. This monument is also in the line fence between the lands now or formerly of Mr. Lewis, and Drew and Home. Soil about one feet muck and the balance white sand. Disk set in sand, the monument in cement. This monument (new one) projects about 15 inches above the ground; otherwise it was found to be in good condition.

Monument No. 90, or Milestone XXXIX

This monument is situated on the east slope of and about 50 paces from the foot of the first ridge west of the Wallkill lowlands, in a stone fence on land of the Standard Oil Co. of N. J., and is

distant 5,278.7 feet west of milestone XXXVIII. It is also about midway between the two westerly brick buildings of the Standard Oil Co. of N. J., and at or near the southerly end of same. At the monument the following bearings and distances were taken: S 70° E, 48 paces to an oak standing just in the edge of the lowland, and N 55° W, 5 paces to an oak stump standing just south of the fence. Disk set in wood ashes. This monument has three of its corners chipped and leans slightly to the southwest; otherwise in good condition. We were unable to see this monument, as it was covered with a coal pile ten feet high.

Monument No. 91, or Road Monument No. 1 between Milestones XXXIX and XL

This monument is situated on the west side of the road which runs N 40° E and S 40° W, about at the west foot of a steep hill, and is distant about 2,100 feet west of milestone XXXIX and about 250 feet north of road running westerly. At the monument the following bearings and distances were taken: N 40° E, 425 paces along the road to house of the N. Y. Transit Co.; N 30° W, to Mr. Clark's house, and N 60° E, 33 paces to a cherry tree. Soil sandy. Disk set in wood ashes. This monument has three of its corners chipped and projects more than usual; otherwise in good condition.

Monument No. 92, or Road Monument No. 2 between Milestones XXXIX and XL

This monument is situated on the south side of a road which runs S 50° E, about 100 paces along the road west of the top and 13 paces west of a jog in the fence, and is distant about 4,173 feet west of milestone XXXIX. The road referred to follows the boundary on the southwest side thereof nearly to milestone XL. At the monument the following bearing and distance were taken: S 30° W about 250 paces to a house standing in a hollow. Soil sandy. Disk set in wood ashes. This monument has westerly corner slightly chipped; otherwise in good condition.

Monument No. 93, or Milestone XL

This monument is situated near the bottom of the west slope of a hill in an old apple orchard, the land of Peter Kimber, and is dis-

tant 5,229.9 feet west of milestone XXXIX and about 30 feet south of road. At the monument the following bearing and distances were taken: N 78° W, 50 paces to a black walnut tree, also about 100 paces to the intersection of the road. Soil sandy. Disk set in sand and monument in cement. This monument (new one) was found to be in good condition in every respect. The old one, an irregular slab of slate, has split and has a portion broken off, lying beside it.

Monument No. 94, or Road Monument No. 1 between Milestones XL and XLI

This monument is situated on the west side of a road which runs nearly north and south, about 100 paces east of the west foot of a hill, and is distant about 278 feet west of milestone XL. At the monument the following bearings and distances were taken: about N 60° W, 100 paces to the northeast corner of Kimber's mill, and S 5° E, 70 feet to a black walnut tree. Soil sandy. Disk set in wood ashes. This monument has its easterly corners slightly chipped and leans slightly to the southwest; otherwise in good condition.

Monument No. 95, or Railroad Monument No. 1 (New York, Susquehanna & Western Railroad) between Milestones XL and XLI

This monument, reset in concrete July 29, 1913, is situated on the west side of the track of the New York, Susquehanna and Western railroad, about 3 feet from the westerly rail and just about at the north end of a slate cut, and is distant 500 paces west of milestone XL. At the monument the following bearing and distance were taken: N 45° E, 225 paces to the southeast corner of a barn. Disk set in wood ashes. This monument, six inches square, has three of its corners chipped, two of them badly; otherwise in good condition.

Monument No. 96, or Road Monument No. 2 between Milestones XL and XLI

This monument is situated on the east side of a road running N 25° E and S 25° W, is distant 2,122 feet west of milestone XL and is at west wall of mill-pond, also is about 20 paces

northeasterly from an intersection of the roads. Soil sandy for one foot, but very hard and stiff. Slate in the bottom. Disk put in the side and a mark cut on the rock. This monument leans badly to the southeast, against the reservoir wall, has 3 feet exposed and has its northwest corner and westerly edge chipped. It should be relocated across the road and set in concrete.

Extract from Mr. Hopper's report of 1916: "I was informed that Mr. Wm. Vail, who built the wall of mill-pond on or about 1908, says he found the disk in the debris of material from wall trench and hence there is a question as to whether or not this stone has been shifted or changed from its original position."

Monument No. 97, or Road Monument No. 3 between Milestones XL and XLI

This monument is situated on the west side of a road which runs N 35° E and S 35° W, about 75 paces from a fork in the road, about at the west foot of a hill, and is distant about 5,083 feet west of milestone XL. At the monument the following bearing and distance were taken: S 35° W, 65 paces to a chestnut tree standing on the roadside at the top of the hill. Soil sandy. Disk set in wood ashes. This monument has its easterly corners slightly chipped; otherwise in good condition.

Monument No. 98, or Milestone XLI

This monument is situated in an open field on the west slope of a small knoll, on land of Mr. Arriman, and is distant 5,280 feet west of milestone XL. At the monument the following bearings and distances were taken: N 45° E, about 200 paces to the southeast corner of Arriman's barn, and S 5° E, 115 paces to the chestnut tree mentioned in the preceding description. Soil sandy. Disk set in sand and monument in cement. This monument projects only 3 inches above the ground and has its westerly corners slightly chipped; otherwise in good condition.

Monument No. 99, or Road Monument No. 1 between Milestones XLI and XLII

This monument is situated on the north side of a road which runs N 68° W and S 68° E and is distant about 418 feet west of milestone XLI. At the monument the following bearing and dis-

tance were taken: S 30° E, 240 paces to the chestnut tree mentioned in the description of monument No. 97. Soil sandy. Disk set in wood ashes. This monument has its corners chipped, two of them badly; otherwise in good condition.

Monument No. 100, or Road Monument No. 2 between Milestones XLI and XLII

This monument is situated on the east side of a road which runs N 25° E and S 25° W, on the westerly slope of a hill, and is distant about 2,906 feet west of milestone XLI. At the monument the following bearings and distances were taken: S 80° E, 12 paces to the northwest corner of R. E. Hallock's wagon-house, and N 35° E, 14 paces to a pear tree standing east of the road. Soil sandy. Disk set in wood ashes. This monument has three of its corners slightly chipped and leans a trifle northeasterly; otherwise in good condition.

Monument No. 101, or Road Monument No. 3 between Milestones XLI and XLII

This monument, reset in concrete July 30, 1913, is situated on the west side of a road which runs N 10° E and S 10° W and is at the east foot of a hill and just opposite or in line with the line fence between the lands of B. J. Hait and Charles Goldsmith. It is distant about 4,624 feet west of milestone XLI. At the monument the following bearings and distance were taken: S 10° W along the road to the northwest corner of Hait's house, and N 45° E, 145 paces along the road to Goldsmith's barn, standing on the east side thereof. Soil sandy. Disk set in wood ashes. This monument does not project as much as usual and has its northwesterly corner slightly chipped; otherwise in good condition.

Monument No. 102, or Milestone XLII

This monument is situated on the east slope of a hill, about 15 paces from the top, 3 feet north of a line fence between the lands of Hait and Goldsmith and in a stone wall running northerly therefrom. It is distant 5,261.95 feet west of milestone XLI. At the monument the following bearing and distances were taken: S 35° E about 300 paces to the northwest corner of Hait's house, and

southeast 3 feet to large oak tree, now dead. Soil sandy, mixed with considerable slate. Disk set in wood ashes. This monument (both stones) was found to be in good condition in every respect. The old stone is an irregular slab of slate.

Monument No. 103, or Road Monument No. 1 between Milestones XLII and XLIII

This monument is situated at the west foot of a steep slope, on the west side of a road which runs N 50° E and S 50° W, and opposite a line fence, and is distant about 1,250 feet west of milestone XLII. At the monument the following bearings and distances were taken: S 51° E, 25 paces to a white oak tree; N 30° E, about 250 paces to the southeast corner of Beatty Brink's house, and S 51° E, 9 paces to a large crows-foot cut in the ledge of rock. Soil sandy. Disk set in wood ashes. This monument has three of its corners slightly chipped and leans slightly to the southwest; otherwise in good condition.

Monument No. 104, or Milestone XLIII

This monument is situated in a line fence between lands of Lewis Clark and John Bossler, in low ground, and is distant 5,270 feet west of milestone XLII. At the monument the following bearings and distances were taken: N 32° W, 57 paces to a sugar maple, and S 51° E about 66 paces to a wire fence running at right angles southwesterly from stone wall. Soil sandy. Disk set in wood ashes. This monument (both stones) was found to be in good condition in every respect. The old stone is an irregular slab. It was rather difficult to find this monument, standing as it does in the center of a stone fence on the line between lands of Lewis Clark and John Bossler.

Monument No. 105, or Road Monument No. 1 between Milestones XLIII and XLIV

This monument is situated on the west side of a road which runs N 30° E and S 30° W, is on the east slope of a small hill about 25 paces from the top, and is distant about 1,014 feet west of milestone XLIII. At the monument the following bearing and distance were taken: S 51° E, 9 paces to an oak on line, which stands

just on the east edge of the road and is the corner between the townships of Greenville and Minnesink, also about 6 feet north of the corner of a line fence between lands of Lewis Clark and John Bossler. Soil sandy and very light. Disk set in wood ashes. This monument has all of its corners chipped, the northwest corner quite badly; otherwise in good condition.

Monument No. 106, or Road Monument No. 2 between Milestones XLIII and XLIV

This monument is situated on the west side of a road which runs about north and south, is on ground sloping gently westward and is distant about 3,685.9 feet west of milestone XLIII. At the monument the following bearings and distances were taken: S 51° E to the corner of a line fence between lands of Alice Northrop and Everett Forgerson; N 55° W, 300 paces to the northeast corner of Forgerson's house, which stands just south of a lane that leaves the main road 150 paces north of the monument, and N 10° E, 60 paces to a white oak tree standing by the roadside. Soil very rocky towards the bottom. Disk set in wood ashes. This monument was found to be in good condition in every respect.

Monument No. 107, or Milestone XLIV

This monument, resèt in concrete July 31, 1913, is situated in a kind of low swampy meadow on the north edge of the lane which runs by Everett Forgerson's house under wire fence and about 20 feet east of the edge of the upland and is distant 5,304 feet west of milestone XLIII. At the monument the following bearings and distances were taken: S 51° E, 5 paces to an oak on line, and N 51° W about 30 feet to a chestnut, now dead, on line, and stone and wire fence running southwest from line. Soil clay with some gravel. Disk set in wood ashes. This monument (new one) was found to be in good condition. The old one is an irregular slab, which is firmly embedded, but inclines to the northeast.

Monument No. 108, or Road Monument No. 1 between Milestones XLIV and XLV

This monument is situated on the south side of a road which runs N 65° E and S 65° W, is on ground sloping gently eastward and is distant about 2,965 feet west of milestone XLIV. At the

monument the following bearing and distance were taken: S 20° W, about 100 feet to a large maple tree standing on the east bank of a brook and in a line fence between the lands of John Taylor and Erastus Courtwright. Soil sandy. Disk set in wood ashes. This monument has its northwest corner slightly chipped; otherwise in good condition.

Monument No. 109, or Milestone XLV

This monument is situated in the northeast corner of a meadow belonging to F. Braisted, just at the southwest corner of the woods and nearly in line with worm fence running southerly, and is distant 5,301 feet west of milestone XLIV. At the monument the following bearings and distances were taken: N 55° W, 450 paces to the northeast corner of Braisted's house, which stands on the west side of the road running along the east foot of Blue mountain, and N 44° E, 15 paces to the line fence referred to in the description of monument No. 110. Soil clayey. Disk set in wood ashes. This monument (new one) projects about two feet above the ground, otherwise it was found to be in good condition. The old one is an irregular slab.

Monument No. 110, or Road Monument No. 1 between Milestones XLV and XLVI

This monument is situated on the east side of a road which runs N 25° E and S 25° W along the east foot of the Blue mountains and is distant 47 feet south of the corner of a line fence between the lands of John Gilson and F. Braisted. At the monument the following bearings and distances were taken: S 55° W, 34 paces to the northeast corner of F. Braisted's house, and N 25° E, 200 paces to the southeast corner of Gilson's house. Soil sandy. Disk set in wood ashes. This monument was found to be in good condition in every respect.

Monument No. 111, or Milestone XLVI

This monument is situated in scrub oaks on property of Ayer, on the west slope of the east summit of the Blue mountains, about 200 paces from the summit. At the monument the following bearings and distances were taken: N 50° W, about 18 feet to a

small blazed pine tree, and S 50° E, 50 paces to two large boulders about on line. Soil sandy. The monument having been broken in getting it to the place was set in only about 1½ feet, but was very firmly wedged. Disk set in wood ashes. This monument (both stones) was found to be in good condition in every respect. The old stone is an irregular slab.

This stone is difficult to reach without a guide. The route runs north of, up and around a steep hill back of Braisted house till you come to Ayer's wire fence and a woods road. Follow road over corduroy crossing of brook, then to the left along another brook and through swampy ground toward High point to "Keep off" sign, where marked trees on line begin. Follow these up over hill to edge of swamp and continue to monument, as described.

Monument No. 112, or Milestone XLVII

This monument is situated on the west slope of the Blue mountains in low thick brush on land of James Hamilton, and is distant 5,280 feet west of milestone XLVI and about 5 paces northwest of the edge of a woods road bearing S 65° W. At the monument the following bearings and distances were taken: S 40° W, 10 paces to a pine oak tree which stands near the angle in the road, also N 40° W, about one-third of a mile to James Hamilton's house. Soil sandy. Disk set in wood ashes. This monument (new one) was found to be in good condition in every respect. The old monument is gone.

Monument No. 113, or Road Monument No. 1 between Milestones XLVII and XLVIII

This monument is situated on the east side of a road which runs a little northeast and southwest and at the foot of Hogback mountain and is distant about 10,000 feet west of milestone XLVI. At the monument the following bearing was taken: N 47° W to the south end of Alex. Burrow's house, or saloon, which stands about 4 feet clear in New York. The line at this point passes between his house and saloon, also on or near the line fence between lands of Michael Fitzsimmons and W. H. Vail. Soil sandy. Disk set in wood ashes. This monument is covered and could not be found. It should be raised and set in concrete.

Monument No. 114, or Milestone XLVIII

This monument is situated on the top of the Hogback mountain in a line wire fence, now down, between lands of Thomas Dutton and the widow Snyder. Also it is on the edge of a path, is 40 feet east of a ridge of rock and 40 paces west of an oak tree about 10 inches in diameter, which stands in said line fence, and is distant 10,419 feet west of milestone XLVI. At the monument the following bearing and distance were taken: N 30° E, 15 paces to a pine tree. No disk used. This monument (new one) has its northwest and southeast corners slightly chipped and leans slightly to the southwest; otherwise in good condition. The old one is an irregular slab and leans slightly to the northeast.

Monument No. 115, or Road Monument No. 1 between Milestone XLVIII and Neversink River Monument

This monument is situated on the west side of a road which runs N 25° E and S 25° W, is at the easterly foot of a slope, and is distant about 300 paces west of milestone XLVIII. Also it is on the line fence between Snyder and Rutan and 26 inches outside the fence in the road. At the monument the following bearing and distance were taken: N 30° W, 100 paces to the southeast corner of Rutan's house. Soil sandy. Disk set in wood ashes. This monument has three of its corners slightly chipped and is about one inch below the surface of ground at the side of the road; otherwise in good condition. As other monuments in the vicinity should be raised and set in concrete, this one may well be reset at the same time.

Monument No. 116, or Neversink River Monument

This monument is situated about 15 paces east of the easterly water edge of the Neversink river and in the line fence between lands of C. W. Rutan and the estate of A. P. Snyder, and about 1,310 feet from monument No. 115. At the monument the following bearing and distance were taken: S 50° E, about 10 feet to a locust tree. Soil sandy. Disk set in wood ashes. This monument (six inches square) has its easterly corners and northerly and southerly edges chipped; otherwise in good condition.

Western Witness, or Reference, Monument

This monument stands on an eminence about midway between the Delaware and Neversink rivers and on land of the Laurel Grove Cemetery Co., and is N 64° E, 72¼ feet from the Tri States rock, or monument. It is similar in form and dimensions (above ground) to the witness, or reference, monument at the eastern terminus of the line and, in addition to the inscription cut on that monument, it is further marked on one of its edges with the words "Witness Monument" and on the north side with the words "The corner between New York and Pennsylvania is in the center of the Delaware river, 475 feet due west of the Tri State Rock" and on the New Jersey side with the words "South 64 degrees W. 72¼ feet from this is the Tri State Rock which is the northwest end of The New York and New Jersey boundary and the north end of the New Jersey and Pennsylvania boundary." This monument has the northeast corner of its base and the southwest corner of the shaft and base slightly chipped, otherwise in good condition, except that the southwest side of base needed to be reinforced with fresh masonry, which was supplied on September 8, 1916.

Tri States Monument

The point which this monument is intended to define was originally indicated by a crow's-foot cut in the natural limestone rock and which in 1874 was very plain, although its cut edges were somewhat smoothed by the exposure of 100 years. In 1874 the United States Coast and Geodetic Survey, at the request of the Geological Survey of New Jersey, determined accurately the latitude and longitude of this point, and at the close of the work marked it by drilling a deep hole in the rock and fastening in it a copper tube filled with lead and setting and describing proper witnesses of its location. The station point according to this determination is in latitude 41° 21′ 22.63″ north, longitude 74° 41′ 40.70″ west from Greenwich.

By order of the joint commission on boundary line between the states of New York and New Jersey the copper bolt was excavated October 30, 1882, in making foundation for the existing granite monument, the center of which was placed directly over the point occupied by the bolt. The monument as originally set

in 1882 was similar in form and dimensions and built into the solid rock in the same manner as the witness, or reference, monument at the eastern terminus of the line. In the spring of 1883 the upper portion was broken off by ice and on May 21, 1885, by order of Commissioner Leavenworth of New York and Commissioner Cook of New Jersey the remaining portion was redressed to the existing dimensions, which are as follows: 2 feet 4 inches long, 1 foot 4 inches wide, and 1 foot 5 inches high above the surface of the rock in which it is embedded. Upon its top surface it was marked with ¼-inch grooves, showing the directions of the lines of the three states which meet there, and within the surfaces bounded by the line, the initials of the respective states are cut. The north side of the stone is further marked with the words "Tri States Monument." This monument is built into the natural rock at the junction of and near the extreme high-water mark of the Delaware and Neversink rivers. It was in good condition, as above described, except that its southeasterly perpendicular edges were slightly chipped and the southwest side needed to be reinforced with fresh masonry, which was applied on September 8, 1916. The joint inspection of 1919 found it in first-class condition.

NOTES

While the above descriptions refer directly to the new monuments, erected in 1882, it should be understood that they also refer indirectly, as regards location, to the old original monuments, which in 1882 were first reset in a substantial manner in their original location, the new mile monuments being then set on the east side contiguous to them and in line therewith.

The disks referred to in the above descriptions are of earthenware, 6 inches in diameter, 1 inch thick and perforated in the center and are, unless otherwise stated, placed vertically beneath the point to be marked by the monument and 6 inches beneath its bottom.

As showing the relative value of the different monuments we quote from an act entitled,

"An act to ratify and confirm the agreement entered into by Commissioners on the part of the States of New York and New Jersey in relation to that portion of the boundary line between

said states extending from the Hudson river on the east to the Delaware river on the west.

"SECOND. The monumental marks by which said boundary line shall hereafter be known and recognized are hereby declared to be: First, the original monuments of stone erected in 1774, along said line by the Commissioners aforesaid as the same have been restored and re-established in their original positions by Edward A. Bowser, surveyor, on the part of New Jersey, and Henry W. Clarke, surveyor, on the part of New York, duly appointed by the parties hereto; Second, the new monuments of granite erected by the aforesaid surveyors at intervals of one mile, more or less, along said line and numbered consecutively, beginning from the Hudson river, and severally marked on the northerly side with the letters 'N. Y.' and on the southerly side with the letters 'N. J.'; and Third, the monuments of granite erected by the aforesaid surveyors at intervening points on said line at its intersection with public roads, railroads and rivers, and severally marked by them, on the northerly side with the letters 'N. Y.' and on the southerly side with the letters 'N. J.'; and Fourth, the terminal monuments erected at the western terminus of said line at the confluence of the Delaware and Neversink rivers, and the terminal monuments erected on the brow of the rock called the Palisades near the eastern terminus, and the rock lying and being at the foot of the Palisades on the bank of the Hudson river, and marked as the original terminal monument of said line established in 1774; as the same are described in a joint report made to the parties hereto by Elias W. Leavenworth, Commissioner on the part of New York, and George H. Cook, Commissioner on the part of New Jersey."

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Legislative Document No. 82

STATE OF NEW YORK

SUPPLEMENT

TO THE

ANNUAL REPORT

OF THE

State Engineer and Surveyor

For the Year Ended June 30, 1919

ALBANY
J. B. LYON COMPANY, PRINTERS
1920

REPORT

ON

HYDRAULIC DATA
1919

DEPARTMENT OF STATE ENGINEER AND SURVEYOR

COMPRISING THE TWENTIETH ANNUAL REPORT ON STREAM GAGING

JACOB LABISHINER,
Junior Assistant Engineer

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ILLUSTRATION

REPORT ON STREAM GAGING FOR 1919

Hon. Frank M. Williams, *State Engineer and Surveyor:*

Sir.— It is my privilege to present herewith the report containing the results of the hydraulic work of the Department of State Engineer and Surveyor for the fiscal year ended June 30, 1919.

This report contains hydraulic and climatological data obtained during that period and available on the date submitted, as follows: Observations of water-surface elevations, records of the discharge of streams and precipitation in the Barge canal zone, collected by this Department; gaging records of streams throughout the state, furnished by the United States Geological Survey in coöperation either with this Department or with the New York State Conservation Commission; stream discharge and precipitation, mainly in the Catskill watersheds, supplied by the Board of Water Supply of the city of New York; United States Weather Bureau records, and other stream gagings furnished by corporations or individuals. Credit for same, where due, is given in connection with the several station records. The aim of this report has been to publish not simply data secured by this Department but all available stream flow data in the state during the year in one volume for the convenience of the public. This comprehensive treatment does not apply, however, to rainfall records.

Keeping step with the economical procedure of the Department, a score of gages was discontinued at their respective stations during the year. Many have been reëstablished and the others will be, at or near locks (practically their old locations), to be read by employees of the Department of Public Works as part of their daily tasks, thereby obviating the necessity of paid observers.

The first appearance of newly established and operative gages includes:

No. 401, Seneca river above lock No. 1, near Cayuga.

No. 402, Seneca river below lock No. 1, near Cayuga.

No. 403, Barge canal above lock No. 25, at May's Point.

No. 404, Barge canal below lock No. 25, at May's Point.
No. 405, Oneida river above lock No. 23, near Brewerton.
No. 406, Oneida river below lock No. 23, near Brewerton.
No. 407, Barge canal above lock No. 20, near Whitesboro.
No. 408, Barge canal below lock No. 20, near Whitesboro.
No. 501, Canandaigua outlet above retention dam at Lyons.
No. 502, Clyde river below lock No. 27, at Lyons.
No. 503, Erie canal below lock No. 34, at Lockport.
No. 504, Erie canal above lock No. 35, at Lockport.

A new precipitation station has been established at Linden.

The standard types of gages and bench-marks adopted by this Department are shown on the accompanying illustration and also in the book of "Instructions Regarding Stream Gages," published by the Department in pamphlet form. Type A and Type B gages in the station descriptions are those shown on this illustration.

Gages located at points convenient to Barge canal locks, dams or other structures, where employees of the Department of Public Works are stationed, are read by these men.

The publication of gage heights in connection with discharge tables furnished by the United States Geological Survey has been discontinued, except for stations on streams tributary to the Barge canal system.

Stream measurement work for the state of New York is done in two ways: First, actually by the Department of the State Engineer and Surveyor in the Barge canal zone; second, throughout the remainder of the state by the United States Geological Survey under Mr. C. C. Covert, District Engineer, funds for which work during the fiscal year ended June 30, 1919, were supplied as follows: By the Department of the State Engineer and Surveyor, \$2,500; New York State Conservation Commission, \$10,000; United States Geological Survey, \$4,000.

STANDARD VERTICAL STAFF GAGE, STATE ENGINEER'S DEPARTMENT

View of a Type A gage. Method of erection in two sections, where low-water gage cannot be extended for high-water readings. Bench-marks are seen in the walls at elevations 52.0 and 59.0. Type B gage differs only in manner of attaching, being set at right angles to face of wall.

SCOPE

This report contains records from 189 stream gaging stations, 66 discharge stations, 10 of which show no elevations of water-surface and hence are not included in total for stream gaging, and 62 precipitation stations, maintained as shown below:

MAINTAINED BY	Stream stations	Discharge records	Precipitation stations
	No.	No.	No.
Department of State Engineer	128	5	13
U. S. Geological Survey with Department of State Engineer	17	17	2
U. S. Geological Survey with State Conservation Commission	37	36	....
Board of Water Supply of New York City	......	4	32
U. S. Weather Bureau with Department of State Engineer	......	....	10
Miscellaneous	7	4	5
Totals	189	66	62

Gages maintained by this Department to determine water-surface elevations are in general read to the nearest tenth foot with only occasional half-tenth foot readings (there are a few gages read in inches) and the hundredths of feet appearing in the tables of water-surface elevations are due to the elevations of the zero of the gage and should not be understood to indicate readings to hundredths of feet. The closeness to which readings are made will be evident upon an inspection of each table.

In a report of this kind, where the accuracy of the data from which the tables and computations are made depends largely on the care of the observers at the various stations and on natural conditions affecting stream flow, apparent inconsistencies will be found, but it is believed that the observers are in general faithful in the performance of their duties and that such errors as may occur do not seriously impair the value of the records.

For an explanation of the data you are referred to those sections of the report of Mr. C. C. Covert, District Engineer, United States Geological Survey, headed "Explanation of Data," and "Accuracy and Reliability of Data" (pp. 14–17), which cover the same ground and render a repetition here needless.

I wish to acknowledge the uniform courtesy and valuable assistance I have received from Mr. Covert and his assistants in connection with this work. Credit for records furnished is also due

the Department of Public Works, Mr. John D. Myton, Assistant Engineer for Northern New York, United States Engineer Department, Mr. George T. Todd, Meteorologist, United States Weather Bureau, Mr. J. Waldo Smith, Chief Engineer, Board of Water Supply of New York City and several other individuals and corporations.

Mr. Covert's report of the work of the United States Geological Survey in coöperation with the State of New York, a statement defining certain hydraulic terms used, a table of convenient equivalents, the hydraulic data and the climatological data are attached hereto in the order named.

Respectfully submitted,

JACOB LABISHINER,

Junior Assistant Engineer.

March 25, 1920.

REPORT OF UNITED STATES GEOLOGICAL SURVEY

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

WATER RESOURCES BRANCH

ALBANY, N. Y., *February* 16, 1920.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor, Albany, N. Y.:*

Dear Sir.— Transmitted herewith is a report on the hydrographic work carried on by the U. S. Geological Survey in coöperation with the State of New York for the fiscal year ended June 30, 1919.

The work has been done in coöperation with your Department and with the Division of Inland Waters of the Conservation Commission. Mr. N. C. Grover, Chief Hydraulic Engineer, and Mr. John C. Hoyt, Engineer in charge of the Division of Waters for the Geological Survey have had general supervision.

The accompanying report has been prepared under my direction by O. W. Hartwell, Assistant Engineer, assisted by A. H. Davison, Max H. Carson, J. Wendell Moulton, B. F. Howe, Otto Lauterhahn and Gertrude E. Shaw.

Acknowledgments are due engineers of your Department and of the Division of Waters of the Conservation Commission for assistance rendered in field and office.

Very truly yours,

C. C. COVERT,

District Engineer.

REPORT ON HYDROGRAPHIC INVESTIGATIONS CARRIED ON BY THE UNITED STATES GEOLOGICAL SURVEY IN COÖPERATION WITH THE STATE OF NEW YORK CONSERVATION COMMISSION AND STATE ENGINEER AND SURVEYOR

By C. C. COVERT, *District Engineer*

GENERAL STATEMENT

With practically no interruptions because of ice, extreme floods or very low flows, the records for the fiscal year ended with June, 1919, form a marked contrast with any corresponding year of record. Only in two or three cases was there ice obstruction and this condition lasted for a period of but two or three weeks.

SCOPE OF WORK

There were maintained during the year 59 stations. Estimates of discharge are published for 51 stations, giving a total of 604 months' records, or an average of 11.8 months per station per year. There were 322 discharge measurements made, or an average of 5.5 measurements per station of 12 months' records. The total cost per station of 12 months' records was $313.80, as against $313.99 for the previous year.

FINANCIAL STATEMENT

Appropriations.

New York State Conservation Commission.....	$10,000 00
State Engineer and Surveyor	2,500 00
United States Geological Survey...............	4,000 00

Expenditures.

New York State Conservation Commission.....	$8,630 31
State Engineer and Surveyor	2,377 93
United States Geological Survey...............	4,108 00
Outside contributions	635 26

Principal items of cost.

Observers' pay	$2,137 95
Operation and maintenance	4,314 92
Construction	337 90
Office work	4,907 87
Top cost	4,052 86

GAGING STATIONS

Five new stations were established:

Tioga river near Erwins.
Cohocton river near Savona.
Cohocton river near Campbell.
Mud creek near Savona.
West Canada creek near Hinckley.

In addition to the above mentioned stations, some data are available from work on the Barge canal. Because of the rather incomplete stage of this work, however, no attempt was made to publish in this report data other than the daily gage heights and discharge measurements.

The new stations established are due largely to coöperation from power people who are directly interested in the stations mentioned. The cost of installing the stations was borne almost entirely by the coöperating parties. The stations mentioned, records for which are being submitted herewith, are as follows:

Hudson river near Indian Lake.
Hudson river at North Creek.
Hudson river at Thurman.
Hudson river at Spier Falls.
Hudson river at Mechanicville.
Indian lake reservoir.
Indian river near Indian Lake.
Schroon river at Riverbank.
Sacandaga river near Hope.
Sacandaga river near Hadley.
Feeder canal at Glens Falls.
Hoosic river near Eagle Bridge.
Mohawk river at Vischer Ferry dam.
Mohawk river at Crescent dam.
West Canada creek at Hinckley.
Nine-Mile feeder near Holland Patent.
Miscellaneous measurements in Hudson river drainage basin.
East branch of Delaware river at Fish Eddy.
Delaware river at Port Jervis.
Beaver kill at Cooks Falls.
West branch of Delaware river at Hale Eddy.
Susquehanna river at Conklin.
Chenango river at Chenango Forks.
Chemung river at Chemung.
Tioga river near Erwins.
Cohocton river near Savona.
Cohocton river near Campbell.
Mud creek at Savona.
Allegheny river at Red House.
Cattaraugus creek at Versailles.
Little Tonawanda creek at Linden.
Genesee river at Scio.
Genesee river at St. Helena.

Genesee river at Jones bridge.
Canaseraga creek near Dansville.
Canaseraga creek near Cumminsville.
Canaseraga creek near Groveland Station.
Canaseraga creek at Shakers Crossing.
Keshequa creek, Craig Colony, near Sonyea.
Barge canal near South Greece.
Barge canal at Lock 32.
Canadice outlet near Hemlock.
Owasco outlet near Auburn.
Miscellaneous measurements in Lake Ontario drainage basin.
Black river near Boonville.
Black river at Black River.
Forestport feeder near Boonville.
Black River canal, flowing south, near Boonville.
Moose river at Moose River.
Middle branch of Moose river at Old Forge.
Beaver river at State dam.
Oswegatchie river near Heuvelton.
East branch of Oswegatchie river at Newton Falls.
West branch of Oswegatchie river at Harrisville.
Raquette river at Piercefield.
St. Regis river at Brasher Center.
Richelieu river at Fort Montgomery.
Lake George at Rogers Rock.
Ausable river at Ausable Forks.
West branch of Ausable river near Newman.
Saranac river near Plattsburg.

EXPLANATION OF DATA

The stations discussed are considered in order downstream. Records for all stations on the main river from its source to its mouth are presented first and records for its tributaries in regular order, from source to mouth, follow, all records for each tributary drainage basin being given before those of the next basin below.

For each regular current-meter gaging station the following data, so far as available, are given: Description of station, list of discharge measurements, table of daily discharge, table of monthly and yearly discharge and run-off. For stations located on streams tributary to the Barge canal a table of daily gage heights is also given.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such factors as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy and reliability of the data.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, gage height in feet, and discharge in second-feet.

Where published, the table of daily gage heights records the fluctuations of the stage of the river as found from the mean of the gage readings taken each day. At stations not equipped with recording instruments, the gage is usually read by the observer in the morning and in the evening. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams, or by backwater from obstructions, are published as recorded, with suitable foot-notes. The rating table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general, the zero is located somewhat below the lowest known flow, so that the readings shall not have a negative value.

The discharge measurements and gage heights are the base data from which rating tables, daily-discharge tables and monthly-discharge tables are computed.

The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. Rating tables are not published in this report, but if desired for the purpose of verifying the published results they can be made from the daily gage heights and daily discharge as follows:

First, plot the discharge measurements for the current and earlier years on cross-section paper with gage heights in feet as ordinates and discharge in second-feet as abscissas. Then, tabulate a number of gage heights taken from the daily gage-height table* for the complete range of stage given and the corresponding discharge for the days selected from the daily-discharge table, and plot the values on cross-section paper. The last points plotted will define the rating curve used and will lie among the plotted discharge measurements. After drawing the rating curve, a table can be developed by scaling off the discharge in second-feet for each tenth foot of gage height. These values should be so adjusted that the first differences shall always be increasing or constant, except for known conditions of backwater.

* Where gage heights are not published, copies can be had upon application to the State Engineer or United States Geological Survey, Albany, N. Y.

The table of daily discharge gives the discharge in second-feet corresponding to the observed gage heights as determined from the rating tables.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the assumed mean for the day, it does not indicate correctly the stage when the water-surface was at crest height and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column headed "Minimum," the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns are based.

The base data presented in this report, unless otherwise stated in description of station, have been collected by the methods commonly used at current-meter gaging stations and described in standard text books.

ACCURACY AND RELIABILITY OF DATA

The accuracy of stream-flow data depends primarily on the natural conditions at the gaging station and on the methods and care with which the data are collected. Errors of the first group depend upon the degree of permanency of channel and of permanency of the relation between discharge and stage. Errors of the second class are due, first, to errors in observation of stage; second, to errors in measurements of flow; and third, to errors due to misinterpretation of stage and flow data.

Even though the monthly means for any station may represent with a high degree of accuracy the quantity of water flowing past the gage, the figures showing discharge per square mile and depth of run-off in inches may be subject to errors which result from including in the measured drainage area some noncontributing districts or omitting estimates of water diverted for municipal supplies or other purposes, and they should, therefore, be considered as only approximate, particularly for winter periods or low water. For these errors it is as a rule not feasible to make adequate correction.

The table of monthly discharge is so arranged as to give a general idea of the flow at the station, but should be used only for preliminary estimates. The computations of daily discharge allow more detailed studies of the variation in flow by which the period of deficiency may be determined.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published, and the engineer who makes use of the figures presented in this report should familiarize himself with the conditions under which they were collected before attempting to draw conclusions for periods other than those covered by the data.

HYDRAULIC DATA

Definition of Terms

Barge canal datum is sea-level (mean tide) at Governor's Island, which has been taken as 14.73 feet below the "Grist-mill" bench-mark in Greenbush (now Rensselaer). This bench-mark was established by the United States Coast and Geodetic Survey in 1857 and is described as a cross cut in the face of the cellar wall of an old grist-mill at Greenbush, opposite Albany. This structure was replaced about 1905 by an office building on the same foundation and is now owned by the Cornell Steamboat Company. The elevations given herein, unless otherwise noted, are feet above Barge canal datum, indicated as (B. C. datum), which is the datum used in the construction of the Barge canal by the State of New York.

The United States Engineer Department uses in its work on the Hudson river and Lake Champlain two datum planes. All elevations south, or downstream from and exclusive of the new Federal dam at Troy (1,400 feet north of the old State dam) are referred to an assumed plane of **lowest low water** in the Hudson river at this locality, indicated as (L. L. W.), which is 2.0 feet below the mean sea-level at Sandy Hook, N. J., or 15.863 feet below the elevation of "Greenbush" bench-mark as published in the Annual Report of the United States Coast and Geodetic Survey for 1903, Appendix No. 3. This plane of lowest low water (L. L. W.) is 1.13 feet below Barge canal datum. To reduce lowest low water (L. L. W.) elevations to Barge canal datum (B. C. datum), subtract 1.13 feet.

All elevations used by the United States Engineer Department in connection with the new Federal dam at Troy and north thereof are referred to mean sea-level at Sandy Hook, N. J., indicated as (M. S. L.). Mean sea-level (M. S. L.) at Albany is 0.87 foot

above Barge canal datum (B. C. datum), but on Lake Champlain mean sea-level (M. S. L.) is only 0.81 foot above Barge canal datum (B. C. datum).

Elevations (M. S. L.) at Albany + 0.87 foot = Elevations (B. C. datum).

Elevations (M. S. L.) on Lake Champlain + 0.81 foot = Elevations (B. C. datum).

The volume of water flowing in a stream — the "run-off" or "discharge" — is expressed in various terms, each of which has become associated more or less definitely with a certain class of work. These terms may be divided into two groups — (1) those which represent a rate of flow, as "second-feet," "gallons per minute," "gallons per 24 hours," "miner's inches" and "run-off in second-feet per square mile," and (2) those which represent the actual quantity of water, as "run-off in depth in inches," "million gallons," "cubic feet," and "acre-feet." The units used in this report are "second-feet," "second-feet per square mile," "run-off depth in inches" and "million gallons." They may be defined as follows:

"**Second-foot**" is an abbreviation for cubic foot per second and represents the rate of discharge of water flowing in a channel one square foot in cross-section at a rate of one foot per second. It is generally adopted as the fundamental unit in the measurement of flowing water and is the "natural" unit, as the foot and second are the units used in making the physical determinations. Other units may be computed from this by the use of factors given in the table of equivalents.

"**Second-feet per square mile**" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"**Run-off depth in inches**" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed over the surface. It is used for comparing run-off with rainfall, which is usually expressed as depth in inches.

CONVENIENT EQUIVALENTS

The following is a list of convenient equivalents for use in hydraulic computations:

Table for converting discharge in second-feet per square mile into run-off in depth in inches over the area

SEC.-FT. PER SQ. MI.	DEPTH IN INCHES FOR PERIODS INDICATED							Sec.-ft per sq. mi.
	1 day	28 days	29 days	30 days	31 days	365 days	366 days	
1.........	0.037190	1.041322	1.078512	1.115702	1.152893	13.574380	13.611570	1
2.........	.074380	2.082645	2.157025	2.231405	2.305785	27.148760	27.223140	2
3.........	.111570	3.123967	3.235537	3.347107	3.458678	40.723140	40.834711	3
4.........	.148760	4.165289	4.314050	4.462810	4.611570	54.297521	54.446281	4
5.........	.185950	5.206612	5.392562	5.578512	5.764463	67.871901	68.057851	5
6.........	.223140	6.247934	6.471074	6.694215	6.917355	81.446281	81.669421	6
7.........	.260331	7.289256	7.549587	7.809917	8.070248	95.020661	95.280992	7
8.........	.297521	8.330579	8.628099	8.925620	9.223140	108.595041	108.892562	8
9.........	.334711	9.371901	9.706612	10.041322	10.376033	122.169421	122.504132	9

NOTE.— For partial month, multiply the values for one day by the number of days.

1 second-foot equals 7.49 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot for one year covers 1 square mile 1.131 feet, or 13.572 inches, deep.

1 second-foot for one year equals 31,536,000 cubic feet.

1 second-foot for one day equals 86,400 cubic feet.

1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for 1 day.

1,000,000,000 cubic feet equals 414 second-feet for one 28-day month.

1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.

1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.

1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.

1,000,000 United States gallons per day equals 1.55 second-feet.

100 United States gallons per minute equals 0.223 second-foot.

1 inch deep on 1 square mile equals 2,323,200 cubic feet.

1 inch deep on 1 square mile equals 0.0737 second-foot per year.

1 foot equals 0.3048 meter.

1 mile equals 1.60935 kilometers.

1 mile equals 5,280 feet.

1 acre equals 0.4047 hectare.

1 acre equals 43,560 square feet.

1 acre equals 209 feet square, nearly.

1 square mile equals 2.59 square kilometers.

1 cubic foot equals 0.0283 cubic meter.

1 cubic foot of water weighs 62.5 pounds.

1 cubic meter per minute equals 0.5886 second-foot.

1 horse-power equals 550 foot-pounds per second.

1 horse-power equals 76.0 kilogram-meters per second.

1 horse-power equals 746 watts.

1 horse-power equals 1 second-foot falling 8.80 feet.

$1\frac{1}{3}$ horse-power equals about 1 kilowatt.

To calculate water-power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horse-power on water-wheel realizing 80 per cent of theoretical power.

ST. LAWRENCE RIVER DRAINAGE

GENERAL FEATURES

The surface waters of an area of 565,000 square miles in extent pass to the ocean by way of St. Lawrence river. In form this area is an irregular parallelogram extending southwestward for about 900 miles with a fairly uniform breadth of 250 miles. The Great Lakes, into which the river expands, have a water-surface of 95,600 square miles, leaving for the land surface drained by the river about 470,000 square miles. More than eight-tenths of this area belongs to Canada. The remainder constitutes a part of the United States. With the exception of about 50,000 square miles (including the whole of the Gaspe Peninsula) in the eastern part of the Province, the Canadian portion lies wholly on the north side of the river. The only part of the United States lying north of the river is at the west end of Lake Superior.

At its mouth the river and its tributaries are drowned, so that the salt water of the ocean enters to form the broad bay of St. Lawrence, with its irregular margin, and even beyond the bay there is indication of a river valley carved in the continental shelf completely covered by the ocean waters. Upstream from the bay of St. Lawrence the water area narrows and the water freshens, though the tide rises nearly as far as Montreal, where the St. Lawrence is a very broad river with gentle current. Just above Montreal the river becomes a series of violent rapids, and from this point upstream it consists of stretches of quiet water separated by rapids. At the outlet of Lake Ontario the river passes through a maze of islands, beyond which is Lake Ontario — the lowest of the five Great Lakes.

The lakes are connected by broad rivers and straits, which in places are navigable, are elsewhere interrupted by rapids and in one place are broken by one of the great falls of the world — Niagara. To the entire area above the mouth of Lake Ontario no large river is tributary. In places the divide runs close to the lakes and is nowhere far from them.

In the northwestern part of the state of New York, between Niagara and St. Lawrence rivers, is an area aggregating 12,400 square miles drained by streams which flow into Lake Ontario. The divide which controls this drainage is very irregular. Extending to the south and southeast from Fort Niagara, it passes around the headwaters of the Genesee a short distance into Pennsylvania; thence reëntering New York it turns southward and eastward taking in the finger lake region, turns to the north, encircles the sources of Black river, turns again to the west and descends to the lake. The country thus included is level or gently undulating in the counties bordering the lake, but farther south it becomes more rolling and a series of ridges, gradually increasing in height, stretch down between Cayuga and Seneca and their companion lakes, finally becoming merged with the elevated, broken country forming the principal divide whose abrupt slopes reach altitudes of 2,000 to 2,500 feet above the headwaters of the Genesee. The easterly or Black river lobe of the drainage basin receives the run-off from the southwestern slope of the Adirondack mountains — largely a rugged and forest-covered area receiving heavy precipitation, especially in the winter. The principal streams of the area are Genesee, Oswego (formed by the union of Seneca and Oneida rivers, which drain the chain of lakes in central New York), Salmon and Black rivers. A small area in the western part of the state is drained by Lake Erie.

St. Lawrence river receives the flow of a number of New York streams having their sources in a northerly slope of the Adirondacks and fed by the numerous lakes with which the region is dotted. Some of these rivers, as the Grass, Raquette and St. Regis, lie entirely within the United States; others, notably Salmon, Trout, Chateaugay and English rivers, cross the international boundary and flow northward into the St. Lawrence in Canada, as does also Richelieu river, the outlet of Lake Champlain. The following table gives a list of the principal tributaries of the St Lawrence in the United States, with the areas drained by them, determined chiefly from Bien's Atlas of the state of New York.

Drainage areas of St. Lawrence River Tributaries in the United States

	Square miles		Square miles
Oswegatchie river	1,609	Salmon river *a*	273
Grass river	637	Trout river *b*	129
Raquette river	1,219	Chateaugay river *b*	199
St. Regis river	910	English river *b*	53
Little Salmon river *a*	103	Lake Champlain *c*	7,867

a Above junction near international boundary. *b* At New York State line. *c* Above outlet.

The St. Lawrence drains, through Lake Champlain, an area of nearly 4,560 square miles in the state of Vermont. This drainage is practically all from Missisquoi, Lamoille and Winooski rivers and Otto creek. Clyde, Barton and Black rivers, in northern Vermont, are tributary to St. Lawrence river through Lake Memphremagog and St. Francis river.

NIAGARA RIVER DRAINAGE

GENERAL FEATURES

Niagara river connects Lakes Erie and Ontario. It receives the drainage from Tonawanda creek and adjacent smaller areas in New York.

NIAGARA RIVER

NIAGARA RIVER AT TONAWANDA CREEK, TONAWANDA

Gage No. 221

This station, established by this Department, January 23, 1905, is located on Tonawanda creek about 400 feet above its junction with Niagara river and 1,100 feet below the State dam, at the New York Central railroad drawbridge. A staff gage was used until April 8, 1908, when a Friez automatic gage, making a seven-day graph, was installed just below the bridge and has been used since, being checked by weekly readings on the staff gage. The automatic gage has a range of eight feet, between elevations 565.0 and 573.0.

On December 1, 1916, a standard Type A gage, No. 221, in two sections, having a range of eight feet, was erected on the back of the easterly abutment of the drawbridge, to replace the old gage, the lower section reading from 563.0 to 567.0 and the upper section from 567.0 to 571.0. A standard bench-mark plug was set in the rear face of the abutment close to the gage at elevation 571.0 (B. C. datum). Mean daily water-surface has been taken from the graph to the nearest tenth of a foot.

Daily elevation of water-surface (B. C. datum) of NIAGARA RIVER AT TONAWANDA CREEK, TONAWANDA, for the year ended June 30, 1919. L. H. Barrows, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	567.9	567.1	567.2	567.0	567.3	*c*	567.3	567.0	*s*	567.3	567.5	567.8
2	567.3	567.2	567.0	567.2	567.3	*c*	*p*	566.9	566.9	567.5	568.3	567.8
3	567.0	566.8	567.2	567.1	567.1	*c*	*p*	566.8	566.8	567.4	567.8	567.8
4	567.0	567.0	566.7	567.0	567.0	*c*	*p*	567.2	566.9	*s*	567.5	567.8
5	567.0	567.1	567.0	567.3	566.7	*c*	*p*	567.5	566.8	*s*	567.9	567.8
6	567.1	567.1	567.1	567.2	566.8	*c*	*p*	567.2	566.8	567.3	567.6	567.8
7	567.1	567.3	567.2	566.7	567.0	*c*	*p*	567.2	566.8	567.3	567.8	*s*
8	567.1	567.3	567.2	566.9	566.8	567.1	*p*	567.1	566.8	567.2	567.7	568.2
9	567.3	567.3	567.2	567.0	567.1	566.9	*p*	567.0	567.5	567.1	567.3	568.2
10	567.2	567.2	567.0	567.1	567.2	565.9	*p*	566.9	567.6	567.2	567.2	568.2
11	567.1	567.2	566.9	567.0	566.8	566.9	*p*	566.9	567.5	567.5	567.8	568.1
12	567.0	567.2	567.3	567.1	566.8	567.2	566.9	566.8	567.4	567.6	568.0	568.0
13	567.0	567.3	567.6	*p*	567.2	566.7	*p*	566.6	*p*	567.6	568.0	*s*
14	567.0	567.3	567.3	*p*	567.0	*n*	*p*	*s*	*p*	567.4	567.9	*s*
15	567.0	567.2	567.3	*p*	566.9	567.1	*p*	*s*	566.7	566.9	567.9	568.2
16	567.0	567.2	567.1	*p*	566.8	566.9	*p*	567.3	567.1	567.3	567.8	568.2
17	567.0	566.9	567.0	*p*	566.7	566.6	*p*	567.0	567.2	567.8	568.1	568.1
18	567.0	566.5	567.1	*p*	567.3	566.7	*p*	567.1	568.0	567.8	568.2	568.0
19	567.0	566.6	567.6	*p*	567.5	566.8	567.0	567.1	567.4	567.6	567.9	568.1
20	567.1	566.9	567.3	567.3	567.0	566.9	566.9	566.7	567.3	567.7	567.4	568.0
21	567.0	567.1	567.3	567.1	567.0	566.9	566.8	567.2	567.3	567.6	567.9	*s*
22	567.0	567.1	567.3	566.8	567.0	567.0	566.9	566.6	567.1	567.5	568.1	567.8
23	567.0	567.1	567.4	566.8	567.2	567.3	567.1	567.7	567.3	567.5	*s*	567.9
24	567.0	567.1	567.1	566.8	567.7	566.4	567.5	567.0	567.3	568.1	568.1	567.9
25	567.0	567.1	567.0	567.0	567.6	567.8	567.0	566.8	567.2	568.2	568.0	567.9
26	567.0	567.2	567.3	566.8	566.8	*c*	567.4	567.6	567.2	568.1	568.0	*s*
27	567.2	566.8	567.6	566.8	567.1	*c*	567.3	567.3	567.6	567.8	567.8	*s*
28	567.1	567.0	567.7	567.1	566.8	*c*	567.1	*s*	567.7	567.6	567.7	*s*
29	567.2	567.3	567.1	567.0	568.6	567.4	567.4	......	567.6	567.6	567.8	567.5
30	567.2	567.0	567.0	567.0	568.0	567.1	567.4	......	567.4	567.4	567.8	567.6
31	566.9	567.2	......	567.1	......	567.0	567.4	......	567.3	......	567.8	......

p Pen failed to record properly; float stuck. *c* Chain on gage caught. *n* Not accurate enough to record. *s* Clock stopped.

CATTARAUGUS CREEK

DESCRIPTION

Cattaraugus creek rises in the southwestern part of Wyoming county and flows in a westerly direction, entering Lake Erie about 25 miles southwest of Buffalo, on the boundary line between Erie and Chautauqua counties. The stream is about 55 miles long and drains an area of approximately 560 square miles above the mouth. A large portion of its course forms the boundary between Erie and Chautauqua counties. Its headwaters rise at an elevation of between 1,900 and 2,000 feet. The drainage basin is hilly, fairly well timbered and rather narrow. There are few tributary streams, those of most importance entering the river from the south.

South branch of Cattaraugus creek, which is the largest tributary, enters at a point about two miles above Gowanda. There is a dam at Gowanda, which is used for developing electric power and also for running a local grist-mill.

CATTARAUGUS CREEK AT VERSAILLES

Location.—At the three-span highway bridge in the village of Versailles, Cattaraugus county, 2¼ miles above the mouth of Clear creek, about 6 miles below Gowanda and about 8 miles above the mouth of the stream.

Drainage area.— 467 square miles. (Measured on post-route map.)

Records available.— September 23, 1910, to June 30, 1919.

Gage.— Chain, on upstream side of right span of bridge; read by Charles Wilson.

Discharge measurements.— Made from the downstream side of bridge or by wading.

Channel and control.— Rock and gravel; shifting.

Extremes of discharge.— Current year: Maximum stage recorded, 9.5 feet at 7:15 P. M., May 10; discharge, 14,200 second-feet. Minimum stage recorded, 0.35 foot several times in August, 1918; discharge, 50 second-feet.

1910–1919: Maximum open-water stage recorded, 11.6 feet at 5:40 P. M., March 25, 1918; discharge, about 30,000 second-feet. Minimum stage recorded, 4.35 feet several times in August, 1918; discharge, about 49 second-feet.

Ice.— Stage-discharge relation seriously affected by ice.

Accuracy.— Stage-discharge relation not permanent. Affected by ice during large portion of the period from December to March, inclusive. Gage read to half-tenths twice daily. Daily discharge throughout the year ascertained by indirect method of applying mean daily effective gage heights to rating table. Effective gage heights determined from discharge measurements. Results fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of CATTARAUGUS CREEK AT VERSAILLES, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Aug. 22	E. D. Burchard	4.45	78.1
Aug. 22	E. D. Burchard	4.50	78.4
Aug. 22	E. D. Burchard	4.60	117
1919			
April 2	J. W. Moulton	5.05	365
April 17	M. H. Carson	5.90	1,580
May 17	J. W. Moulton	6.24	2,460
June 18	J. W. Moulton	4.94	208

Daily gage height, in feet, of CATTARAUGUS CREEK AT VERSAILLES, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	4.85	4.75	4.60	4.85	5.8	5.08	6.4	5.00	6.7	5.20	5.48	5.20
2	4.82	4.68	4.50	4.80	6.0	5.00	6.35	4.88	5.55	5.04	5.5	5.12
3	4.75	4.65	4.50	5.35	5.8	5.08	5.5	5.00	5.40	5.04	5.38	5.12
4	4.69	4.65	4.55	5.02	5.85	5.15	5.20	5.05	5.38	5.15	5.35	5.16
5	4.63	4.70	4.70	4.92	5.9	5.10	5.6	5.05	5.55	5.22	5.7	5.20
6	4.60	4.62	4.95	5.18	5.45	5.12	5.6	4.92	5.45	5.15	5.45	5.10
7	4.62	4.50	4.72	5.5	5.30	5.00	5.7	5.08	5.28	5.32	5.38	5.12
8	4.58	4.55	4.58	5.15	5.25	6.0	5.75	5.05	5.20	5.25	5.35	5.15
9	4.65	4.62	4.58	5.02	5.10	6.25	5.7	5.00	6.4	5.65	5.42	5.10
10	4.80	4.68	4.42	4.92	5.12	5.6	5.40	4.98	6.0	6.2	7.2	5.05
11	4.92	4.65	4.55	4.88	5.08	5.40	5.30	4.98	5.7	7.0	7.6	5.05
12	4.78	4.75	4.50	4.88	5.00	5.45	5.10	5.08	5.45	6.5	6.3	5.00
13	4.70	4.65	4.65	4.98	5.00	5.35	4.80	5.05	5.65	6.0	5.9	5.00
14	4.6[illegible]	4.60	4.75	4.90	4.95	5.9	5.6	5.38	5.20	5.75	5.65	5.00
15	4.55	4.48	4.68	4.90	4.90	6.4	5.75	5.85	5.22	5.6	5.48	5.00
16	4.60	4.38	4.72	4.85	4.90	5.7	5.6	5.30	5.6	6.05	5.40	4.95
17	4.65	4.42	5.12	4.82	4.95	5.42	5.7	5.15	6.25	5.85	6.3	4.92
18	4.60	4.48	5.02	4.78	5.05	5.25	5.55	5.10	6.3	5.7	5.8	4.92
19	4.58	4.42	4.98	4.75	5.35	5.15	5.20	5.00	5.75	5.55	5.46	4.95
20	4.55	4.48	5.25	4.80	5.35	5.08	5.18	4.95	5.48	5.40	5.45	4.98
21	4.55	4.45	5.10	5.6	5.28	5.05	5.22	5.10	5.40	5.6	6.6	4.95
22	4.50	4.48	5.05	5.15	5.30	5.22	5.48	5.08	5.32	5.35	7.6	4.91
23	4.52	4.58	5.02	5.20	5.18	5.5	5.7	5.75	5.20	5.25	6.45	4.90
24	4.52	4.48	5.00	4.92	5.05	5.32	6.0	5.35	5.20	6.0	6.0	4.90
25	5.00	4.42	5.12	4.85	5.00	5.7	5.48	5.35	5.15	5.5	5.85	4.92
26	4.70	4.48	4.95	4.95	4.95	5.45	5.40	5.38	5.10	5.48	5.6	5.26
27	4.62	4.42	5.12	5.02	4.92	5.28	5.25	5.12	5.15	5.85	5.48	5.45
28	4.80	4.42	5.18	4.98	5.00	5.18	5.15	5.15	5.30	6.0	5.35	5.12
29	4.70	4.52	4.98	5.22	5.45	5.12	5.12	......	5.12	6.0	5.3	4.98
30	5.48	4.70	4.88	5.25	5.38	5.15	5.08	......	5.12	5.6	5.2	4.95
31	4.90	4.50	......	6.45	......	5.20	5.02	......	5.12	......	5.2	......

Daily discharge, in second-feet, of CATTARAUGUS CREEK AT VERSAILLES, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	240	180	120	240	1,200	380	2,400	320	3,200	500	900	400
2.....	220	150	85	200	1,600	320	2,400	240	900	360	950	340
3.....	180	140	85	650	1,200	380	850	320	700	360	800	340
4.....	150	140	100	340	1,300	460	500	380	700	460	750	320
5.....	150	160	160	280	1,400	400	400	380	900	500	1,200	400
6.....	120	130	300	480	750	440	380	280	750	460	900	320
7.....	130	85	170	850	600	320	400	380	550	600	800	340
8.....	110	100	110	460	550	1,500	460	380	500	550	750	380
9.....	140	130	110	340	400	2,000	400	320	2,400	1,000	850	320
10.....	220	150	65	280	440	950	300	320	1,500	2,000	5,000	280
11.....	280	140	100	240	380	700	260	320	1,100	4,400	7,000	280
12.....	200	180	85	240	320	750	200	380	750	3,000	2,600	240
13.....	160	140	140	320	320	650	200	380	1,000	1,800	1,700	240
14.....	150	120	180	260	300	1,400	950	700	500	1,300	1,300	240
15.....	100	80	150	260	260	2,400	1,200	1,300	500	1,000	1,000	240
16.....	120	55	170	240	260	1,000	1,000	600	950	1,900	900	220
17.....	140	65	440	220	300	750	1,100	460	2,000	1,500	2,600	200
18.....	120	80	360	190	380	550	900	400	2,200	1,200	1,500	200
19.....	110	65	320	180	650	460	500	320	1,200	1,000	1,000	220
20.....	100	80	550	200	650	380	480	300	800	800	1,000	240
21.....	100	75	420	950	550	380	500	400	700	1,000	3,400	220
22.....	85	80	380	460	600	500	800	380	600	750	6,000	200
23.....	95	110	360	500	480	900	1,000	1,200	500	650	2,400	180
24.....	95	80	340	280	380	600	1,600	650	500	1,800	1,400	180
25.....	340	65	440	240	320	1,100	800	700	460	950	1,200	190
26.....	160	80	300	300	300	750	700	700	400	900	800	420
27.....	130	65	440	340	280	550	550	440	460	1,500	700	600
28.....	220	65	500	320	320	480	460	460	600	1,700	550	320
29.....	160	95	320	500	750	440	440	......	440	1,700	500	220
30.....	800	160	260	550	700	460	380	......	440	1,000	480	200
31.....	280	85	......	2,600	......	500	340	......	440	......	440	......
Mean...	181	107	252	436	598	737	737	479	924	1,220	1,660	283

Monthly discharge of CATTARAUGUS CREEK AT VERSAILLES, for the year ended June 30, 1919

[Drainage area, 467 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	800	85	181	0.388	0.45
August	180	55	107	0.229	0.26
September	550	65	252	0.540	0.60
October	2,600	180	436	0.934	1.08
November	1,600	260	598	1.28	1.43
December	2,400	320	737	1.58	1.82
January	2,400	200	737	1.58	1.82
February	1,300	240	479	1.03	1.07
March	3,200	400	924	1.98	2.28
April	4,400	360	1,220	2.61	2.91
May	7,000	440	1,660	3.55	4.09
June	600	180	283	0.606	0.70
The year	7,000	55	634	1.36	18.51

TONAWANDA CREEK

DESCRIPTION

Tonawanda creek rises in Wyoming county and flows northward into Genesee county. At Batavia it turns abruptly to the west

and continues in that direction until it reaches the Niagara river at Tonawanda. After passing out of Genesee county it forms the boundary between Niagara county and Erie county.

Tonawanda creek rises in a rather hilly country and, in the upper part of its basin, flows through a rather narrow valley. Its main tributary is Little Tonawanda creek, which flows into the stream from the right about 3 miles south of Batavia.

Between Pendleton and Tonawanda the creek and the Erie canal are coincident, the creek leaving the canal over the State dam at Tonawanda. Water for canal purposes is passed eastward in the canal from Tonawanda creek and Lake Erie.

ERIE CANAL AT CHANGE BRIDGE, PENDLETON

This station is located at change bridge over the Erie canal at its junction with Tonawanda creek about ½ mile southwest of Pendleton. The gage is a staff secured to a pile under the old tow-path bridge. It is read once daily — at 5 P. M.— to half-tenths.

Daily elevation of water-surface (B. C. datum) of ERIE CANAL AT CHANGE BRIDGE, PENDLETON, for the year ended June 30, 1919. Homer Snell, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	567.5	566.35	566.4	566.4	566.5	566.0	567.0	566.6	567.2	567.1	567.5	567.7
2.....	566.4	566.5	566.4	566.4	566.8	566.1	567.2	566.5	566.8	567.4	568.3	567.8
3.....	566.35	566.4	567.0	566.4	566.4	565.9	567.0	566.4	566.75	567.1	567.3	567.7
4.....	566.35	566.65	566.0	566.3	566.25	566.65	567.8	567.25	566.75	566.95	567.25	567.7
5.....	566.5	566.5	566.0	566.8	566.1	566.0	566.8	567.3	566.5	566.95	568.5	567.85
6.....	566.4	566.5	566.55	566.6	566.85	565.9	566.9	566.6	566.5	566.95	567.6	568.0
7.....	566.4	566.6	566.4	566.1	566.2	566.5	567.0	566.9	566.5	566.85	568.0	567.75
8.....	566.5	566.85	566.4	566.3	566.0	566.5	567.5	566.6	566.0	566.65	567.5	567.9
9.....	566.7	566.5	566.4	566.4	566.5	566.0	567.3	566.5	567.9	566.8	566.8	567.9
10.....	566.6	566.5	566.0	566.65	566.5	565.3	567.0	566.4	568.1	566.5	567.25	567.8
11.....	566.4	566.5	566.4	566.35	566.05	566.7	566.5	566.3	567.9	567.5	569.4	567.7
12.....	566.1	566.6	566.6	566.6	566.15	566.6	566.3	566.1	567.6	567.7	570.0	567.7
13.....	566.0	566.6	567.0	566.6	566.8	566.1	566.4	565.9	566.0	567.7	569.5	567.85
14.....	566.2	566.6	566.6	566.7	566.2	566.4	566.7	566.6	565.8	567.15	568.3	567.8
15.....	566.35	566.5	566.65	566.4	566.2	566.9	566.9	566.9	566.0	566.5	567.95	567.9
16.....	566.2	566.4	566.2	566.2	566.1	566.7	566.9	567.2	567.0	568.5	567.6	567.55
17.....	566.1	566.1	566.4	566.5	566.0	566.25	566.8	566.8	567.1	568.2	568.7	567.7
18.....	566.5	566.0	566.35	565.65	566.8	566.4	566.85	566.6	568.1	567.7	568.45	567.65
19.....	566.5	566.0	566.5	565.65	567.0	566.5	566.4	566.6	567.5	567.5	567.8	567.75
20.....	566.4	566.3	566.65	567.2	566.4	566.4	566.3	566.25	567.3	567.5	568.0	567.65
21.....	566.4	566.3	566.4	566.4	566.5	566.4	566.3	566.4	567.0	567.3	567.85	567.75
22.....	566.4	566.5	566.7	566.2	566.3	566.7	566.5	566.2	566.9	567.5	568.9	567.65
23.....	566.3	566.75	566.75	566.15	566.5	566.7	566.4	567.75	567.0	567.4	570.3	567.5
24.....	566.35	566.35	566.2	566.15	567.4	565.5	567.0	566.65	566.9	568.1	570.0	567.5
25.....	566.4	566.4	566.25	566.3	567.0	568.0	566.7	566.65	566.85	568.3	569.1	567.5
26.....	566.5	566.6	566.5	566.2	566.0	567.0	567.5	567.5	566.9	568.0	568.1	567.65
27.....	566.3	566.3	566.8	566.2	566.3	566.9	566.9	566.8	567.4	567.5	567.75	567.4
28.....	566.0	566.4	567.4	566.7	565.7	566.8	566.9	566.4	567.4	567.8	567.8	567.5
29.....	566.5	566.5	566.4	566.25	567.2	567.3	567.1	......	567.3	567.7	567.85	567.5
30.....	566.3	566.35	566.1	566.2	567.25	566.7	567.1	......	567.0	567.6	567.8	567.4
31.....	566.0	566.3	......	566.7	......	566.6	566.9	......	566.85	......	567.8	......

LITTLE TONAWANDA CREEK

LITTLE TONAWANDA CREEK AT LINDEN

Location.—At the stone arch highway bridge in the village of Linden, Genesee county, about 3 miles above the junction with Tonawanda creek.

Drainage area.— 22 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— July 8, 1912, to June 30, 1919.

Gage.— Vertical staff, on right upstream abutment of bridge. Lower 2 feet of enameled iron, graduated to hundredths of a foot; upper 4 feet of bronze graduated to half-tenths; read by C. L. Schenck and Thomas W. Mills.

Discharge measurements.— High-water measurements made from a cable 1,000 feet above gage; low-water measurements made by wading near gage.

Channel and control.— Channel of coarse gravel and boulders and is probably permanent between dates of shift.

Extremes of discharge.— Current year: Maximum stage recorded, 9.0 feet at 6 P. M., May 10; discharge 2,500 second-feet. Minimum stage recorded, -0.46 foot at 8 P. M., August 20, 1918; discharge, 0.8 second-foot.

1912–1919: Maximum stage recorded, 9.0 feet at 6 P. M., May 10, 1919; discharge, 2,500 second-feet. Minimum stage recorded, 0.18 foot, August 20 and 21, September 14 to 16 and October 8, 1913; discharge, 0.43 second-foot.

Accuracy.— Stage-discharge relation permanent between dates of shift. Rating curve fairly well defined. Gage read to hundredths of a foot twice daily.

Daily discharge ascertained by applying mean daily gage height to rating table. Results fairly good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of LITTLE TONAWANDA CREEK AT LINDEN, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 23	C. C. Covert	-0.39	0.70
Aug. 21	E. D. Burchard	-0.47	0.60
1919			
Jan. 23	E. D. Burchard	0.22	36.8
May 16	J. W. Moulton	0.13	35.6
June 17	J. W. Moulton	0.015	25.0
June 17	J. W. Moulton	0.005	25.7

Daily gage height, in feet, of LITTLE TONAWANDA CREEK AT LINDEN, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	-0.26	-0.43	-0.45	-0.37	-0.02	-0.08	0.45	-0.14	1.25	-0.04	0.20	-0.16
2	-0.30	-0.44	-0.46	-0.36	-0.08	-0.14	0.32	-0.18	0.32	-0.04	0.12	-0.17
3	-0.34	-0.44	-0.47	-0.34	0.15	-0.17	0.02	-0.18	0.08	-0.08	0.04	-0.20
4	-0.35	-0.43	-0.47	-0.32	-0.06	-0.15	0.20	-0.16	0.16	-0.08	0.06	-0.21
5	-0.36	-0.42	-0.42	-0.33	-0.02	-0.16	0.14	-0.12	0.37	-0.08	0.58	-0.14
6	-0.38	-0.44	-0.43	-0.14	-0.10	0.04	0.12	*a*	0.24	-0.02	0.17	-0.02
7	-0.38	-0.45	-0.46	-0.08	-0.17	-0.04	0.13	*a*	0.12	0.17	0.05	-0.04
8	-0.38	-0.45	-0.46	-0.22	-0.20	0.74	0.12	*a*	0.04	0.00	0.01	1.4
9	-0.36	-0.39	-0.47	-0.26	-0.20	0.54	*a*	*a*	1.3	0.35	0.09	0.46
10	-0.34	-0.42	-0.47	-0.27	-0.19	0.10	*a*	*a*	0.61	0.66	4.7	0.05
11	-0.36	-0.34	-0.47	-0.29	-0.22	-0.01	*a*	*a*	0.41	1.3	2.5	-0.08
12	-0.36	-0.45	-0.46	-0.29	-0.23	0.03	*a*	*a*	0.26	0.59	1.3	-0.13
13	-0.38	-0.46	-0.41	-0.26	-0.24	0.04	*a*	*a*	0.20	0.37	0.60	-0.18
14	-0.39	-0.46	-0.45	-0.25	-0.26	0.52	*a*	0.40	0.11	0.28	0.30	-0.20
15	-0.39	-0.46	-0.45	-0.26	-0.26	0.46	*a*	0.18	-0.04	0.09	0.16	-0.20
16	-0.39	-0.47	-0.40	-0.28	-0.27	0.12	*a*	0.02	0.62	1.1	0.14	1.0
17	-0.39	-0.47	-0.38	-0.30	-0.26	-0.01	*a*	-0.09	1.45	0.32	0.50	0.01
18	-0.40	-0.47	-0.42	-0.30	-0.16	-0.10	*a*	0.00	1.1	0.19	0.24	-0.15
19	-0.40	-0.47	-0.40	-0.32	-0.10	-0.14	*a*	*a*	0.32	0.08	0.08	-0.20
20	-0.40	-0.48	-0.32	-0.26	-0.15	-0.11	*a*	*a*	0.14	0.04	2.2	-0.18
21	-0.42	-0.47	-0.35	0.02	-0.13	-0.13	*a*	-0.16	0.12	0.05	2.3	-0.20
22	-0.42	-0.42	-0.38	-0.14	-0.16	0.01	-0.04	-0.16	0.03	0.00	4.7	-0.23
23	-0.42	-0.46	-0.40	-0.20	-0.19	0.02	0.20	0.04	-0.02	-0.06	0.95	-0.26
24	-0.42	-0.46	-0.36	-0.22	-0.22	-0.02	0.29	-0.05	-0.02	0.55	0.48	-0.26
25	-0.42	-0.46	-0.34	-0.23	-0.23	0.70	0.24	-0.02	-0.08	0.26	0.29	-0.27
26	-0.42	-0.47	-0.34	-0.22	-0.26	0.12	-0.04	0.10	-0.12	0.30	0.14	0.86
27	-0.43	-0.47	-0.34	-0.20	-0.28	-0.0[illegible]	-0.10	*a*	-0.04	1.05	0.06	0.08
28	-0.44	-0.47	-0.34	-0.20	-0.26	-0.10	-0.12	0.10	-0.02	0.82	-0.01	-0.12
29	-0.38	-0.45	-0.36	-0.12	-0.06	-0.13	-0.14	......	-0.07	0.65	-0.06	-0.19
30	-0.38	-0.46	-0.37	-0.15	-0.10	-0.16	-0.15	......	-0.09	0.25	-0.10	-0.22
31	-0.41	-0.44	......	0.13	......	-0.14	0.01	......	-0.03	......	-0.14	......

a No record.

Daily discharge, in second-feet, of LITTLE TONAWANDA CREEK AT LINDEN, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	5.9	1.2	0.9	2.4	18	14	59	11	158	17	35	10
2	4.3	1.0	0.8	2.7	14	11	46	9.2	46	17	28	9.6
3	3.2	1.0	0.6	3.2	11	9.6	21	9.2	25	14	22	8.2
4	3.0	1.2	0.6	3.8	16	11	35	10	32	14	24	7.8
5	2.7	1.3	1.3	3.5	18	10	30	12	51	14	73	11
6	2.1	1.0	1.2	11	13	22	28	10	39	18	32	18
7	2.1	0.9	0.8	14	9.6	17	29	8	28	32	23	17
8	2.1	0.9	0.8	7.4	8.2	91	28	6	22	19	20	180
9	2.7	1.9	0.6	5.9	8.2	68	18	5	165	49	26	60
10	3.2	1.3	0.6	5.5	8.7	26	14	5	76	82	940	23
11	2.7	3.2	0.6	4.7	7.4	19	12	5	55	165	380	14
12	2.7	0.9	0.8	4.7	7.0	21	12	7	40	74	165	12
13	2.1	0.8	1.5	5.9	6.6	22	14	20	35	51	75	9.2
14	1.9	0.8	0.9	6.2	5.9	66	26	54	27	42	44	8.2
15	1.9	0.8	0.9	5.9	5.9	60	22	33	17	26	32	8.2
16	1.9	0.6	1.6	5.1	5.5	28	19	21	77	136	30	123
17	1.9	0.6	2.1	4.3	5.9	19	18	14	188	46	64	20
18	1.6	0.6	1.3	4.3	10	13	18	19	136	34	39	11
19	1.6	0.6	1.6	3.8	13	11	16	13	46	25	25	8.2
20	1.6	0.5	3.8	5.9	11	12	15	11	30	22	320	9.2
21	1.3	0.6	3.0	21	12	12	15	10	28	23	340	8.2
22	1.3	1.3	2.1	11	10	20	17	10	21	19	940	7.0
23	1.3	0.8	1.6	8.2	8.7	21	35	22	18	16	116	5.9
24	1.3	0.8	2.7	7.4	7.4	18	43	16	18	73	62	5.9
25	1.3	0.8	3.2	7.0	7.0	86	39	18	14	40	43	5.5
26	1.3	0.6	3.2	7.4	5.9	28	17	26	12	44	30	105
27	1.2	0.6	3.2	8.2	5.1	18	13	24	17	130	24	25
28	1.0	0.6	3.2	8.2	5.9	13	12	26	18	100	19	12
29	2.1	0.9	2.7	12	16	12	11	......	15	80	16	8.7
30	2.1	0.8	2.4	11	13	10	11	......	14	40	13	7.4
31	1.5	1.0	......	29	......	11	20	......	16	......	11	......
Mean	2.16	0.964	1.69	7.76	9.80	25.8	23.0	15.5	47.9	48.7	129	25.3

NOTE.— Discharge estimated, January 9 to 21, February 6 to 13, 19, 20 and 27, by comparing gage-height record with that of Allegheny, Red House, Cattaraugus and Versailles.

Monthly discharge of LITTLE TONAWANDA CREEK AT LINDEN, for the year ended June 30, 1919

[Drainage area, 22 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	5.9	1.0	2.16	0.098	0.11
August	3.2	0.5	0.964	0.044	0.05
September	3.8	0.6	1.69	0.077	0.09
October	29	2.4	7.76	0.353	0.41
November	18	5.1	9.80	0.446	0.50
December	91	9.6	25.8	1.17	1.35
January	59	11	23.0	1.04	1.20
February	54	5	15.5	0.705	0.73
March	188	12	47.9	2.18	2.51
April	165	14	48.7	2.21	2.47
May	940	11	129	5.86	6.76
June	180	5.5	25.3	1.15	1.28
The year	940	0.5	28.1	1.28	17.46

ERIE CANAL ABOVE LOCK No. 35, AT LOCKPORT

Gage No. 504

A new station was established above lock No. 35 in the city of Lockport. A painted wooden gage, No. 504, is located on the north wall of the lock about midway between the upper and lower gates and just above the head of the locks in the old canal; the range is eight feet, between elevations 563.5 and 571.5. The nearest bench-mark is state B. M. No. 526-D, the bottom step of old lock No. 71, at elevation 560.130 (B. C. datum).

The gage is read by an employee of the Department of Public Works.

Daily elevation of water-surface (B. C. datum) of BARGE CANAL ABOVE LOCK No. 35, AT LOCKPORT, for the year ended June 30, 1919. W. P. Gyatt, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	566.7	566.1	566.2	566.1	566.5	567.3	566.4	567.0	566.4	566.7	......	567.3
2	566.8	566.1	566.1	566.2	566.6	565.2	568.3	566.6	566.6	566.9	568.2	567.5
3	566.2	566.1	566.0	566.2	566.7	566.0	566.9	566.6	566.6	567.0	568.2	567.6
4	566.1	566.1	566.2	566.2	566.2	565.9	567.1	565.9	567.0	567.0	568.0	567.6
5	566.0	566.3	566.0	566.1	565.8	565.9	567.0	566.9	566.4	566.8	567.7	567.6
6	566.2	566.2	566.2	566.6	565.9	565.7	566.5	567.3	566.4	566.9	568.2	567.6
7	566.2	566.3	566.2	566.4	566.0	565.9	566.5	566.9	566.4	566.9	567.5	567.8
8	566.0	566.4	566.1	565.7	566.2	565.5	566.6	566.8	566.5	566.9	567.2	567.6
9	566.2	566.4	566.3	566.0	565.7	565.7	566.6	567.1	566.0	566.7	567.0	567.7
10	566.7	566.3	565.9	566.1	566.2	565.5	567.4	566.5	566.8	566.9	566.5	568.0
11	566.2	566.3	565.9	566.4	566.3	565.6	567.4	566.4	567.4	566.9	568.0	567.7
12	566.0	566.3	566.1	566.3	565.9	566.3	566.0	566.3	567.6	567.4	569.4	567.6
13	565.7	566.4	566.4	566.5	565.9	565.7	566.7	566.2	567.4	567.6	569.4	567.5
14	565.7	566.4	566.8	566.4	565.9	566.0	566.5	566.0	565.7	567.2	568.1	567.5
15	565.8	566.2	566.2	566.4	566.2	566.4	566.4	566.6	565.6	567.1	567.9	567.7
16	566.0	566.2	566.3	566.1	565.7	566.8	566.9	566.8	566.6	566.1	567.7	567.7
17	565.8	565.9	566.2	566.1	565.9	566.4	566.8	566.8	566.9	568.3	567.7	567.7
18	566.3	565.5	566.1	566.3	565.6	565.9	566.6	566.7	567.2	567.8	568.3	567.5
19	566.3	565.8	566.3	566.0	565.9	566.2	566.5	566.8	568.1	567.7	568.1	567.5
20	566.3	566.0	566.5	566.2	566.7	566.2	566.5	566.5	567.6	......	567.4	567.6
21	566.4	566.3	566.6	566.0	566.1	566.2	566.4	566.3	567.2	......	567.6	567.6
22	566.5	566.2	566.3	566.2	566.0	566.3	566.4	566.5	566.9	......	568.2	567.4
23	566.3	566.4	566.7	566.1	566.0	566.8	566.5	566.1	566.8	......	569.8	567.3
24	566.2	566.3	566.3	565.7	566.2	566.0	567.0	567.4	566.9	......	570.1	567.2
25	566.2	566.2	566.2	566.1	566.8	566.0	566.8	566.7	566.9	......	569.7	567.5
26	566.3	566.2	566.0	565.9	566.2	567.4	566.5	566.4	566.7	......	568.5	567.4
27	566.2	566.1	566.4	565.6	565.8	566.8	567.3	567.1	567.0	......	567.9	567.5
28	566.0	566.1	566.0	565.9	566.0	566.7	566.6	566.5	567.2	......	567.6	567.1
29	566.2	566.5	566.9	566.2	566.6	566.8	566.9	......	567.2	......	567.6	567.1
30	566.2	566.2	566.2	565.9	566.6	567.2	567.1	......	567.1	......	567.7	567.2
31	566.1	566.2	......	566.1	......	566.6	567.1	......	567.0	......	567.7	......

NOTE.— Guard-gate closed and water drawn, April 20 to 30, 1919. Guard-gate opened May 1 1919.

ERIE CANAL BELOW LOCK No. 34, AT LOCKPORT

Gage No. 503

A new station was established at lock No. 34, below the lock, in the city of Lockport. A painted wooden gage, No. 503, was placed at the west end of the buffer-beam recess on the south lock wall, opposite the power-house; the range is eight feet, between elevations 508.9 and 516.9 (B. C. datum). The nearest bench-mark is state B. M. No. 526, the bottom step of old lock No. 67, at elevation 519.940 (B. C. datum).

The gage, is read by an employee of the Department of Public Works.

Daily elevation of water-surface (B. C. datum) of BARGE CANAL BELOW LOCK No 34, AT LOCKPORT, for the year ended June 30, 1919. W. P. Gyatt, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	512.8	513.5	514.1	513.7	514.0	514.2	512.5	510.1	510.4	510.8	......	513.2
2......	512.9	513.5	514.3	513.5	513.6	514.1	511.8	509.1	510.3	510.8	506.9	513.2
3......	512.9	513.5	514.1	513.5	513.6	514.8	512.2	509.1	510.3	511.9	510.4	513.5
4......	512.8	513.5	513.9	513.4	514.3	514.7	512.2	510.1	510.5	511.9	513.9	513.5
5......	513.1	513.6	513.7	513.6	514.1	514.7	512.2	510.4	510.6	511.7	513.2	513.5
6......	513.0	513.8	513.9	513.5	514.0	514.9	511.6	510.2	510.7	511.6	513.4	513.5
7......	512.9	513.7	513.8	513.5	514.3	514.7	511.6	510.3	510.4	510.3	513.6	513.6
8......	512.9	513.8	513.9	513.5	514.1	515.0	511.6	510.3	510.5	511.6	513.6	513.5
9......	512.8	513.9	514.1	513.8	514.1	514.9	511.6	510.1	509.9	512.5	513.7	513.5
10......	512.8	513.7	514.1	513.9	514.1	514.9	511.6	509.7	510.2	512.1	513.6	513.5
11......	512.9	513.6	514.1	513.8	513.8	515.0	511.7	510.1	511.3	512.6	513.7	513.7
12......	513.2	513.6	514.0	513.5	513.8	514.7	509.9	510.2	510.9	512.1	513.5	513.5
13......	514.0	513.6	514.0	513.5	514.1	514.7	507.8	510.3	510.6	510.1	513.5	513.2
14......	514.0	513.8	513.8	513.6	514.1	514.7	509.9	510.1	510.2	509.9	513.7	513.4
15......	514.2	514.0	513.9	513.5	513.9	514.2	510.8	510.2	510.2	511.8	513.6	513.6
16......	514.1	514.0	514.1	513.6	514.0	513.5	511.0	510.0	510.5	511.8	512.6	513.4
17......	514.1	514.0	513.9	513.5	514.0	513.7	511.1	509.7	509.7	511.8	513.1	513.3
18......	513.9	514.1	514.1	513.6	514.1	513.9	511.3	509.2	510.8	512.7	513.0	513.5
19......	513.5	513.9	514.0	513.6	514.1	513.9	511.3	509.2	511.7	512.6	513.0	513.5
20......	513.3	513.7	514.3	513.5	514.0	513.2	511.5	509.2	511.2	......	513.2	513.5
21......	513.0	513.6	513.7	513.5	514.4	512.7	511.7	509.1	510.5	......	513.3	513.6
22......	513.0	513.7	513.9	513.7	514.1	511.8	511.8	509.2	510.0	......	513.2	513.4
23......	513.0	513.7	513.6	513.8	514.0	511.2	511.7	509.9	509.7	......	513.1	513.7
24......	513.1	513.7	513.8	513.0	513.9	512.3	511.5	509.9	509.7	......	512.6	513.9
25......	513.0	513.7	513.7	513.9	514.1	512.1	511.7	510.5	510.7	......	512.9	513.7
26......	513.1	513.6	513.7	513.0	514.1	512.1	511.1	510.4	509.0	......	512.9	513.9
27......	513.3	513.6	513.6	513.1	514.1	512.3	510.3	510.6	510.8	......	512.9	513.8
28......	513.5	513.6	513.6	513.1	513.9	512.5	510.2	510.2	511.5	......	512.8	513.9
29......	513.5	513.6	513.6	513.0	514.1	512.1	510.1	......	511.5	......	512.8	513.8
30......	513.7	513.7	513.7	513.0	514.3	512.0	510.3	......	510.9	......	512.6	513.7
31......	513.7	513.6	......	513.9	......	512.4	509.9	......	509.0	......	512.6	......

NOTE.—Guard-gate closed and water drawn, April 20 to 30, 1919. Guard-gate opened May 1, 1919.

GENESEE RIVER DRAINAGE BASIN

GENESEE RIVER

DESCRIPTION

Genesee river rises in Potter county, Pa., 8 or 10 miles south of the New York–Pennsylvania boundary, flows northwestward for about 32 miles by general course, then turns to the northeast and empties into Lake Ontario, 7 miles north of Rochester. The entire length of the stream, following bends, is about 135 miles and the drainage area is about 2,450 square miles.

In the 39 miles between Belmont, in central Allegany county, and Portage, in southwestern Livingston county, the fall of the water-surface is 253 feet, an average of 6.4 feet per mile. At Portage the river plunges down in three magnificent falls and thence nearly to Mount Morris flows at the bottom of a deep gorge. From Mount Morris to Rochester the valley is broad and open and the stream is bordered by meadows subject to occasional overflow. At Rochester there is another abrupt descent over three heavy falls, amounting to about 260 feet within the city.

In the northern counties the surface is rolling, with long, easy slopes, except along the streams, which usually lie in deep ravines, hemmed in by steep banks. On the whole there is a gradual rise away from the lakes and in the upper half of the basin the country becomes rough and is broken by ridges, the summits of which attain elevations of from 2,000 to 2,500 feet above tide.

Precipitation is rather low, the average rainfall being about 35 inches, some 14 inches smaller than that of the upper Sacandaga.

Above all the private dams at Rochester the State formerly maintained a dam for diverting water to the Erie canal, and in the basin of Black creek, one of the upper tributaries of the Genesee from the west, are two reservoirs (Rockville and Cuba reservoirs), owned by the State, also used for the benefit of the Erie canal.

Cuba reservoir, on the Genesee–Allegheny divide, receives the drainage from a tributary area of 26.6 square miles. The storage volume is 454,000,000 cubic feet. The overflow from this reservoir enters Allegheny river. The storage water may be turned into the summit level of the abandoned Genesee Valley canal and thence into Genesee river.

The series of remarkable lakes tributary to the Oswego basin is continued westward into the basin of the Genesee and includes Conesus, Hemlock, Canadice, and Honeoye lakes. These lakes serve as natural reservoirs and have inlets draining considerable areas at their upper ends. The slopes adjacent to the lakes themselves are narrow and steep and are drained by gullies and torrential brooks. The area below the lakes is rolling and the soil is rich and extensively cultivated. The areas and elevations of these lakes are shown in the following table:

Areas and elevation of LAKES IN GENESEE RIVER BASIN a

LAKE	Elevation	Water-surface area	Drainage area	Per cent, water-surface
	Feet	*Square miles*	*Square miles*	
Hemlock lake	896	2.8	46.8	5.98
Canadice lake	1,092	1.0	12.6	7.94
Honeoye lake	800	2.5	39.6	6.31

a These lake basins are shown on the Honeoye, Canandaigua, Naples and Wayland topographic atlas sheets of the United States Geological Survey, from which the area of Honeoye lake has been taken. Areas of Hemlock and Canadice lakes are from surveys of the Rochester water-works.

Drainage areas of tributaries of GENESEE RIVER a

NAME OF STREAM	AREA IN SQUARE MILES		
	Tributary	GENESEE RIVER Above tributary	GENESEE RIVER Below tributary
Cryder creek	43.3	99.9	143.2
Chenunda creek	30.0	181.0	211.0
Dyke's creek	68.3	214.0	282.3
Vandemark creek	21.6	301.3	322.9
Knight's creek	22.3	323.9	346.2
Phillips creek	32.3	372.8	405.1
Vancampens creek	55.7	410.4	466.1
Angelica creek	82.1	481.1	563.2
White creek	15.9	569.2	585.1
Black creek (Allegany county)	31.1	595.5	626.6
Crawford creek	11.8	637.6	649.4
Caneadea creek	63.3	651.0	714.3
Cold creek	41.0	745.3	786.3
Rush creek	35.3	787.0	822.3
Wiscoy creek (including East Koy creek)	108.6	833.6	942.2
East Koy creek	59.9	....	....
Wolf creek	19.3	974.9	994.2
Silver lake outlet	30.4	1,029.2	1,059.6
Canaseraga creek, Livingston Co. (including Keshequa creek)	340.7	1,066.4	1,407.1
Keshequa creek (formerly Coshaqua)	82.0	....	....
Beards creek	41.3	1,423.1	1,464.4
Conesus lake outlet	88.8	1,555.5	1,643.9
Honeoye creek	262.6	1,675.9	1,938.5
Allen's creek	198.1	1,947.1	2,145.2
Black creek (Monroe county)	211.8	2,168.5	2,380.0
Genesee river, total at mouth	....	....	2,445.6

a From an early report on Genesee river storage, Report of State Engineer, 1890, plate facing p. 422.

GENESEE RIVER AT SCIO

Location.—At the steel highway bridge, 1/4 mile above Vandemark creek, 1/2 mile above the village of Scio, Allegany county, and 1 mile above Knight creek.

Drainage area.— 288 * square miles.

Records available.— June 12, 1916, to June 30, 1919.

Gage.—Vertical staff, attached to downstream face of left bridge abutment; read by Miss Retta Potter and Mrs. Margaret Potter.

Discharge measurements.— Made from the downstream side of the bridge at medium and high stages and by wading at low stages.

Channel and control.— Coarse gravel and probably permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 9.1 feet at noon May 22; discharge, 10,600 second-feet. Minimum stage recorded, 0.58 foot at 5 P. M., August 28; discharge, 38 second-feet.

1916–1919: Maximum stage recorded, 9.1 feet at noon May 22, 1919; discharge, 10,600 second-feet. Minimum stage recorded, 0.60 foot, August 25 and 26, 1916; discharge, 25 second-feet.

Ice.— Stage-discharge relation affected by ice.

Accuracy.— Stage-discharge relation practically permanent. Affected by ice during a large portion of the period from December to March, inclusive. Rating curve well defined between 25 and 5,500 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results good except for periods when the stage-discharge relation is affected by ice, when results are fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

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* Revised area as computed by engineers of the State Conservation Commission. Formerly given as 297 square miles.

Discharge measurements of GENESEE RIVER AT SCIO, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Aug. 23........	E. D. Burchard..................................	0.69	56.7
Aug. 23........	E. D. Burchard..................................	0.69	58.2
1919			
Jan. 23........	E. D. Burchard..................................	1.24	234
Apr. 3........	J. W. Moulton..................................	1.48	308
Apr. 19........	M. H. Carson..................................	2.15	677
May 19........	J. W. Moulton..................................	2.19	709
June 19........	J. W. Moulton..................................	0.89	126

Daily gage height, in feet, of GENESEE RIVER AT SCIO, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	1.5	0.70	1.09	1.25	1.30	1.20	1.6	1.05	2.8	1.5	1.48	1.6
2......	1.45	0.60	0.75	1.20	1.45	1.20	2.5	1.15	1.41	1.47	1.48	1.44
3......	1.40	0.60	0.74	1.30	1.5	1.20	1.85	1.26	1.30	1.48	1.37	1.32
4......	1.35	0.60	0.72	1.20	1.6	1.20	1.7	1.02	1.28	1.7	1.5	1.24
5......	1.30	1.7	0.75	1.20	1.65	1.20	1.65	1.08	1.5	1.9	1.5	1.18
6......	1.25	1.00	1.32	1.7	1.5	1.20	1.6	0.92	1.6	1.75	1.42	1.10
7......	1.20	0.80	1.00	1.6	1.48	1.20	1.75	1.05	1.5	1.7	1.5	2.15
8......	1.15	0.80	0.90	1.45	1.44	1.30	1.6	0.94	1.43	2.8	1.55	1.6
9......	1.15	1.00	0.89	1.30	1.42	1.20	1.55	1.7	2.15	3.1	1.7	2.45
10......	0.05	0.85	0.89	1.20	1.5	1.20	1.40	1.29	2.1	3.5	4.2	1.6
11......	0.75	1.20	0.90	1.20	1.30	1.20	1.7	1.05	1.85	4.3	3.9	1.40
12......	0.70	1.00	0.90	1.20	1.30	1.20	1.36	1.05	1.65	4.0	3.8	1.24
13......	0.60	1.00	1.00	1.30	1.30	1.20	1.5	1.03	1.65	3.2	3.0	1.12
14......	0.70	1.00	1.05	1.20	1.34	1.30	1.32	1.24	1.36	2.8	2.6	1.00
15......	0.60	1.00	1.00	1.30	1.30	1.30	1.42	1.38	1.39	2.5	2.4	0.86
16......	0.60	1.00	0.98	1.30	1.30	1.40	1.44	1.07	1.38	2.8	2.35	0.80
17......	0.60	0.90	1.40	1.20	1.5	1.6	1.20	0.99	2.25	2.5	3.0	*a*
18......	0.70	0.90	1.30	1.20	2.2	1.7	1.43	1.07	3.0	2.3	2.5	*a*
19......	0.60	0.90	1.20	1.10	4.8	1.6	1.19	1.25	2.2	2.1	2.15	*a*
20......	0.60	0.80	4.2	1.10	4.2	1.6	1.28	1.22	2.0	2.0	2.25	1.42
21......	0.60	0.80	2.25	1.20	2.2	1.6	1.46	0.94	1.95	2.1	5.6	1.25
22......	0.60	0.80	1.85	1.10	2.0	1.65	1.10	0.88	1.85	1.8	7.8	0.97
23......	0.60	0.70	1.7	1.00	1.9	1.8	1.26	0.90	1.6	1.75	6.2	0.88
24......	0.60	0.70	1.6	0.98	1.7	1.9	1.7	0.89	1.6	1.8	5.4	0.80
25......	0.70	0.70	1.5	1.00	1.6	1.8	1.36	0.92	1.49	1.8	4.4	0.77
26......	0.70	0.60	1.40	1.14	1.5	1.7	1.33	1.07	1.44	1.7	3.4	1.12
27......	0.60	0.60	1.40	1.12	1.5	1.6	1.28	0.86	1.5	1.65	2.9	1.7
28......	0.60	0.59	1.25	1.10	1.40	1.5	1.20	1.00	1.85	1.6	2.35	1.29
29......	0.60	0.61	1.25	1.10	1.30	1.40	1.20	......	*a*	1.6	2.15	1.05
30......	0.70	0.75	1.20	1.35	1.20	1.40	1.18	......	*a*	1.47	1.95	0.94
31......	0.70	0.91	......	1.40	......	1.40	1.05	......	1.75	......	1.75	......

a No record.

Daily discharge, in second-feet, of GENESEE RIVER AT SCIO, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	345	61	178	238	258	218	390	164	1,150	345	336	390
2......	322	41	74	218	322	218	920	200	304	332	336	318
3......	300	41	71	258	345	218	518	242	258	336	287	266
4......	279	41	66	218	390	218	440	154	250	440	345	234
5......	258	440	74	218	415	218	415	174	345	545	345	211
6......	238	147	264	440	345	218	390	122	390	465	309	181
7......	218	87	147	390	336	218	465	164	345	440	345	690
8......	200	87	161	322	318	258	390	128	314	1,150	368	390
9......	200	147	113	258	309	218	368	440	690	1,400	440	885
10......	132	102	113	218	345	218	300	254	660	1,780	2,540	390
11......	74	218	116	218	258	218	440	164	518	2,660	2,210	300
12......	61	147	116	218	258	218	283	164	415	2,320	2,100	234
13......	41	147	147	258	258	218	345	157	415	1,490	1,310	188
14......	61	147	164	218	275	258	266	234	283	1,150	990	147
15......	41	147	147	258	258	258	309	292	296	920	850	104
16......	41	147	141	258	258	300	318	171	292	1,150	815	87
17......	41	116	300	218	345	390	218	144	750	920	1,310	* 180
18......	61	116	258	218	720	440	314	171	1,310	780	920	* 180
19......	41	116	218	181	3,310	390	214	238	720	660	690	* 120
20......	41	87	2,540	181	2,540	390	250	226	600	600	750	309
21......	41	87	750	218	720	390	327	128	572	660	4,390	238
22......	41	87	518	181	600	415	181	110	518	490	8,090	138
23......	41	61	440	147	545	490	242	116	390	465	5,300	110
24......	41	61	390	141	440	545	440	113	390	490	4,110	87
25......	61	61	345	147	390	490	283	122	340	490	2,780	79
26......	61	41	300	196	345	440	271	171	318	440	1,680	188
27......	41	41	300	188	345	390	250	104	345	415	1,230	440
28......	41	39	238	181	300	345	218	147	518	390	815	254
29......	41	43	238	181	258	300	218	......	480	390	690	164
30......	61	74	218	279	218	300	211	......	500	332	572	128
31......	61	119	......	300	......	300	164	......	465	......	465	......
Mean...	114	106	303	231	534	313	334	179	488	815	1,540	254

* Discharge estimated, by comparing with hydrograph of Genesee river at St. Helena and Jones Bridge stations.

NOTE.— Stage-discharge relation not affected by ice.

Monthly discharge of GENESEE RIVER AT SCIO, for the year ended June 30, 1919

[Drainage area, 288 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July..............................	345	41	114	0.384	0.44
August............................	440	39	106	0.357	0.41
September.........................	2,540	66	303	1.02	1.14
October...........................	440	141	231	0.802	0.92
November..........................	3,310	218	534	1.85	2.06
December..........................	545	218	313	1.09	1.26
January...........................	920	164	334	1.16	1.34
February..........................	440	104	179	0.622	0.58
March.............................	1,310	250	488	1.69	1.95
April.............................	2,660	332	815	2.83	3.16
May...............................	8,090	287	1,540	5.35	6.17
June..............................	885	79	254	0.882	0.98
The year..........................	8,090	39	434	1.51	20.41

GENESEE RIVER AT ST. HELENA

Location.—At the steel highway bridge in the hamlet of St. Helena, Wyoming county, about 5½ miles below the village of Portageville and the site of the proposed storage dam of the New York State Conservation Commission, and about 9½ miles above the mouth of Canaseraga creek.

Drainage area.— 992* square miles.

Records available.—August 14, 1908, to June 30, 1919.

Gages.— Stevens water-stage recorder on left bank just below bridge and a chain gage fastened to the upstream side of the bridge, middle span. Chain gage installed August 14, 1908; water-stage recorder installed August 24, 1911. Water-stage recorder inspected by C. S. DeGolyer. Chain gage read by Herman Piper.

Discharge measurements.— Made from the bridge at high stages and by wading at low and medium stages.

Channel and control.— Gravel and rocks; occasionally shifting.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 11.35 feet at 4:30 P. M., May 22; discharge, 32,800 second-feet. Minimum stage from water-stage recorder, 2.0 feet at 7 A. M., July 26, and 6 P. M., August 30; discharge, 59 second-feet.

1908–1919: Maximum stage, from water-stage recorder, 12.81 feet at 8 A. M., May 17, 1916; discharge, 43,500 second-feet. Minimum stage recorded, 1.70 feet at 5 P. M., October 5, and 8 A. M., October 17, 1913; discharge, approximately 18 second-feet.

Ice.— Stage-discharge relation somewhat affected by ice.

Accuracy.— State-discharge relation not permanent. Rating curve for water-stage recorder well defined between 75 and 2,000 second-feet and fairly well defined between 2,000 and 30,000 second-feet. Rating curve for chain gage well defined between 500 and 1,600 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table except for days of great range in stage, when it was determined by averaging results obtained by applying to rating table gage heights for 2-hour periods. Records good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

* Revised area as computed by engineers of the State Conservation Commission. Formerly given as 1,030 square miles.

Discharge measurements of GENESEE RIVER AT ST. HELENA, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 13	E. D. Burchard	2.51	194
July 13	E. D. Burchard	2.50	191
July 25	C. S. DeGolyer	2.15	71
Aug. 21	E. D. Burchard	2.40	144
Aug. 28	C. S. DeGolyer	2.10	57.6
Sept. 20	C. S. DeGolyer	3.23	579
Nov. 23	C. S. DeGolyer	3.86	1,280
Dec. 26	C. S. DeGolyer	4.30	1,780
1919			
Jan. 11	C. S. DeGolyer	3.14	574
April 11	C. S. DeGolyer	6.47	5,920
May 12	C. S. DeGolyer	6.34	5,980
May 15	J. W. Moulton	4.52	2,070
May 22	C. S. DeGolyer	11.03	3,220
June 16	J. W. Moulton	3.05	470

Daily gage height, in feet, of GENESEE RIVER AT ST. HELENA, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	2.64	a	2.28	2.89	4.7	3.35	3.6	2.79	4.6	3.5	3.95	3.85
2	2.65	a	2.26	3.05	4.3	3.0	6.0	2.81	3.95	3.4	3.95	3.7
3	2.52	a	2.48	3.10	4.05	3.1	4.5	2.80	3.55	3.35	3.85	3.55
4	2.48	a	2.36	3.15	3.9	3.25	3.7	2.95	3.4	3.5	3.75	3.45
5	2.49	a	2.48	2.98	4.1	3.15	3.5	2.91	3.65	3.9	4.15	3.35
6	2.41	a	2.55	3.0	4.1	3.2	3.35	2.82	4.0	3.9	4.0	3.3
7	2.41	a	2.79	3.35	3.75	3.1	3.4	2.80	3.7	3.8	3.75	3.85
8	2.22	a	2.69	3.3	3.5	3.25	3.6	2.82	3.6	3.85	3.85	3.85
9	2.45	a	2.55	3.1	3.4	5.3	3.4	2.80	4.6	4.9	3.85	4.35
10	2.40	a	2.54	2.98	3.35	4.2	3.1	2.84	5.3	6.0	a	4.15
11	2.50	a	2.44	2.89	3.4	3.8	3.05	2.52	4.7	7.4	a	3.65
12	2.48	a	2.58	2.88	3.3	3.7	3.45	2.82	4.2	7.6	a	3.35
13	2.46	a	2.56	2.86	3.2	3.8	3.5	2.80	4.25	5.5	a	3.25
14	a	a	2.81	2.98	3.1	4.5	3.4	2.85	3.55	5.3	a	3.1
15	a	a	2.78	2.86	2.96	5.3	3.4	3.75	3.45	4.8	4.7	3.1
16	a	a	2.78	2.92	3.0	4.8	3.5	3.25	3.95	5.1	4.5	3.05
17	a	a	2.86	2.84	2.92	4.1	3.35	2.92	5.4	5.1	a	2.98
18	a	a	3.8	2.72	4.05	3.8	3.3	2.82	6.1	4.7	a	2.99
19	a	a	3.75	2.76	5.1	3.55	3.3	2.71	4.8	4.45	4.6	2.87
20	a	a	3.5	2.62	4.4	3.45	3.1	2.74	4.4	4.15	a	2.82
21	a	a	a	2.72	4.15	3.4	3.15	2.88	4.15	4.2	a	3.15
22	a	a	a	2.91	3.95	3.5	3.2	2.84	4.0	4.05	a	3.1
23	a	a	a	2.82	3.8	4.35	3.4	2.86	3.75	3.8	a	2.86
24	a	a	a	2.76	3.6	4.4	4.25	2.91	3.55	4.25	a	2.78
25	a	a	a	2.76	3.45	4.45	3.9	2.98	3.45	4.35	a	2.75
26	a	a	a	2.72	3.2	4.3	3.6	2.98	3.4	4.15	a	2.90
27	a	a	a	3.2	3.25	3.7	3.45	2.94	3.35	4.4	a	3.5
28	a	a	a	3.2	2.98	3.5	3.3	2.81	3.6	4.5	4.8	3.45
29	a	a	a	3.15	3.15	3.3	3.2	......	3.65	4.6	4.5	3.1
30	a	a	a	3.4	3.3	3.15	3.15	......	3.55	4.2	4.25	2.92
31	a	2.26	a	6.2	......	3.15	2.98	......	3.65	......	4.0	......

a No record.

Daily discharge, in second-feet, of GENESEE RIVER AT ST. HELENA, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	257	132	109	348	2,470	748	985	336	1,770	860	1,300	1,200
2......	262	140	103	450	1,840	470	5,360	348	985	772	1,300	1,050
3......	199	126	182	470	1,500	540	2,140	342	906	730	1,200	906
4......	182	115	136	540	1,310	662	1,090	436	772	860	1,100	838
5......	186	225	182	403	1,560	580	885	410	1,000	1,250	1,540	748
6......	154	451	214	423	1,560	620	748	354	1,360	1,250	1,360	705
7......	154	293	335	705	1,140	540	790	342	1,050	1,150	1,100	1,200
8......	91	209	282	620	885	662	985	354	953	1,200	1,200	1,200
9......	170	190	214	470	790	3,650	790	342	2,140	2,600	1,200	1,800
10......	150	186	209	403	748	1,700	540	366	3,320	4,750	8,600	1,540
11......	190	178	166	348	790	1,200	505	203	2,290	9,000	14,800	1,000
12......	182	281	228	342	705	1,090	838	354	1,600	9,800	6,220	748
13......	174	257	218	331	620	1,200	885	342	1,660	3,700	4,530	662
14......	147	204	346	403	540	2,140	790	372	906	3,320	3,130	540
15......	149	182	329	331	443	3,650	790	1,140	816	2,440	2,290	540
16......	134	278	329	366	470	2,650	885	662	1,300	2,950	2,000	505
17......	126	228	373	320	416	1,560	748	416	3,510	2,950	2,950	456
18......	123	190	1,130	257	1,500	1,200	705	354	4,970	2,290	3,510	463
19......	122	166	1,080	277	3,220	935	705	292	2,440	1,930	2,140	389
20......	111	154	835	211	1,990	838	540	309	1,860	1,540	2,140	359
21......	112	140	2,100	257	1,630	790	580	391	1,540	1,600	11,000	574
22......	106	143	1,080	360	1,370	885	620	366	1,360	1,420	20,500	538
23......	109	129	808	309	1,200	1,920	790	379	1,100	1,150	13,400	383
24......	103	122	650	277	985	1,990	1,770	410	906	1,660	9,000	337
25......	100	115	628	277	838	2,060	1,310	457	816	1,800	8,210	321
26......	97	110	605	257	620	1,840	985	457	772	1,540	4,750	407
27......	143	104	808	540	662	1,090	838	430	730	1,860	3,510	860
28......	122	98	781	540	457	885	705	348	953	2,000	2,440	816
29......	109	103	628	505	580	705	620	......	1,000	2,140	2,000	538
30......	122	115	507	705	705	580	580	......	906	1,600	1,660	419
31......	136	103	......	5,710	......	580	457	......	1,000	......	1,360	......
Mean...	146	176	520	573	1,120	1,290	999	404	1,510	2,400	4,560	735

NOTE.— Discharge, July 1 to 13, and August 31 to September 20, determined from chain gag. heights.

Monthly discharge of GENESEE RIVER AT ST. HELENA, for the year ended June 30, 1919

[Drainage area, 992 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	262	91	146	0.142	0.16
August	451	98	176	0.171	0.20
September	2,100	103	520	0.505	0.56
October	5,710	211	573	0.578	0.67
November	3,220	416	1,120	1.13	1.26
December	3,650	470	1,290	1.30	1.50
January	5,360	457	999	1.01	1.16
February	1,140	203	404	0.407	0.42
March	4,970	730	1,510	1.52	1.75
April	9,800	730	2,400	2.42	2.70
May	20,500	1,100	4,560	4.60	5.30
June	1,800	321	735	0.741	0.83
The year	20,500	91	1,203	1.21	16.51

GENESEE RIVER AT JONES BRIDGE, NEAR MT. MORRIS

Location.—At the highway bridge known as Jones bridge, 1½ miles below Canaseraga creek, about 1¾ miles above the mouth of Beads creek, about 5 miles below the village of Mt. Morris, Livingston county, and 6 miles by river above the village of Geneseo.

Drainage area.— 1,400 * square miles.

Records available.— May 22, 1903, to April 30, 1906; August 12, 1908, to December 31, 1913; July 12, 1915, to June 30, 1919.

Gage.— Gurley 7-day graph water-stage recorder, installed September 11, 1915, on the right bank about 60 feet downstream from the bridge. Prior to 1915 a chain gage fastened to upstream side of highway bridge. Datum of water-stage recorder is 2.73 feet higher than that for the chain gage (540.00 feet, Conservation Commission datum). Water-stage recorder inspected by Theron S. Trewer.

Discharge measurements.— Made from foot-bridge erected on lower chord of bridge truss at the upstream side of the bridge.

Channel and control.— Sandy clay; likely to shift, but, as shown by discharge measurements, fairly permanent in recent years.

Extremes of discharge.— Current year: Maximum stage, from water-stage recorder, 24.45 feet at 2 A. M., May 23; discharge, 32,000 second-feet. Minimum stage from water-stage recorder, 0.45 foot at 1 A. M., July 25; discharge, 63 second-feet.

1902-1919†: Maximum stage recorded, 25.44 feet at noon May 17, 1916; discharge, 55,100 second-feet. Minimum stage recorded, 2.7 feet at 6 P. M., August 29, 1909; discharge about 18 second-feet. See paragraph "Records Available" for limits of periods of no records.

Ice.— Stage-discharge relation seriously affected by ice.

Regulation.— During extreme low water there is some diurnal fluctuation in flow from mills at Mt. Morris.

Accuracy.— Stage-discharge relation practically permanent between dates of shift. Affected by ice for considerable portion of January, February and March. Rating curve well defined between 150 and 7,000 second-feet and fairly well defined between 7,000 and 60,000 second-feet. Operation of water-stage recorder

* Revised area as computed by engineers of the State Conservation Commission. Formerly given as 1,410 square miles.
† Not including periods of no record. See "Records available."

satisfactory throughout the year. Daily discharge ascertained by applying to the rating table mean daily gage heights determined by inspecting the gage-height hydrograph, or for days of considerable fluctuation by discharge integration.

Coöperation.— Station maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of GENESEE RIVER AT JONES BRIDGE, NEAR MOUNT MORRIS, during year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 12	E. D. Burchard	1.36	292
Aug. 21	E. D. Burchard	0.91	159
1919			
Jan. 24	E. D. Burchard	3.83	1,510
Mar. 4	E. D. Burchard	2.96	1,060
April 14	J. W. Moulton	7.93	4,130
May 13	O. W. Hartwell	13.86	7,960
May 14	O. W. Hartwell	10.50	5,930
May 24	J. W. Moulton	21.98	14,300
May 26	J. W. Moulton	15.35	8,960
June 14	J. W. Moulton	2.42	808

Daily gage height, in feet, of GENESEE RIVER AT JONES BRIDGE, NEAR MOUNT MORRIS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	1.56	*a*	0.85	1.99	*a*	2.5	*a*	2.1	*a*	3.25	4.1	4.1
2	1.54	*a*	1.09	1.96	4.8	2.45	*a*	*a*	*a*	2.9	4.1	3.8
3	1.46	0.91	1.12	1.94	4.2	2.2	*a*	*a*	3.5	2.9	3.8	3.45
4	1.32	0.79	1.16	2.0	3.6	2.1	3.7	2.1	3.0	3.1	3.4	3.15
5	1.40	0.94	1.11	2.0	*a*	2.2	4.4	2.1	3.25	3.8	4.0	3.0
6	1.20	*a*	1.20	2.05	4.3	2.2	5.3	2.05	3.9	4.1	4.0	2.9
7	*a*	1.70	1.26	2.6	3.4	2.05	6.0	*a*	3.5	3.8	3.4	3.5
8	*a*	1.37	1.44	2.65	3.05	2.2	6.3	1.75	3.4	3.7	3.4	4.1
9	*a*	1.34	1.39	2.3	2.8	*a*	6.1	1.74	*a*	*a*	3.4	5.8
10	*a*	1.38	1.32	2.1	2.6	4.5	5.1	1.78	*a*	*a*	*a*	5.3
11	*a*	1.17	1.30	1.95	2.65	3.4	4.8	*a*	6.2	*a*	22.9	3.9
12	*a*	1.33	1.26	1.88	2.55	3.15	4.5	1.56	4.9	*a*	19.5	3.15
13	*a*	1.53	1.17	1.83	2.4	3.2	4.5	1.63	4.8	*a*	*a*	2.75
14	*a*	1.33	1.28	1.95	2.25	*a*	4.8	1.77	3.5	*a*	*a*	2.45
15	*a*	1.23	1.57	1.92	2.15	6.2	5.0	*a*	3.15	*a*	7.2	2.25
16	*a*	1.21	1.57	1.88	2.05	5.8	5.1	2.95	*a*	*a*	5.9	2.2
17	*a*	1.43	1.70	1.80	1.98	4.4	4.8	2.4	*a*	7.0	*a*	2.2
18	*a*	1.22	*a*	1.69	*a*	3.7	4.5	2.1	*a*	5.9	*a*	2.15
19	*a*	1.23	2.65	1.65	6.6	3.25	4.3	1.94	*a*	5.2	*a*	2.0
20	*a*	1.20	*a*	1.61	5.3	2.95	4.0	*a*	5.3	4.6	*a*	1.92
21	*a*	1.12	*a*	1.68	4.4	2.8	3.7	1.9	4.7	4.4	*a*	1.83
22	*a*	1.01	3.6	1.93	4.0	2.7	3.4	1.95	4.3	4.3	*a*	2.5
23	*a*	0.96	2.9	1.84	3.6	*a*	3.2	1.96	3.8	3.7	*a*	2.1
24	*a*	*a*	2.6	1.69	3.25	4.1	4.0	2.05	3.3	*a*	*a*	1.81
25	*a*	*a*	2.4	1.61	2.95	*a*	4.4	2.0	3.1	5.3	*a*	1.7
26	*a*	*a*	2.3	1.64	2.75	5.0	3.5	2.1	2.9	4.7	*a*	1.78
27	*a*	*a*	2.65	2.0	2.55	3.8	3.1	2.1	2.8	5.2	*a*	2.2
28	*a*	*a*	2.85	2.2	2.4	3.25	2.8	2.1	3.05	5.4	7.4	3.2
29	*a*	*a*	2.45	2.25	2.35	3.0	2.6	......	3.4	5.8	5.8	2.6
30	*a*	*a*	2.15	2.65	2.5	2.7	2.5	......	3.15	4.9	4.9	2.3
31	*a*	0.85	......	*a*	......	2.6	2.35	......	3.35	......	4.6	......

a No record.

Daily discharge, in second-feet, of GENESEE RIVER AT JONES BRIDGE, NEAR MOUNT MORRIS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	365	165	140	560	3,310	815	1,110	615	1,250	1,220	1,720	1,720
2.....	357	162	204	545	2,150	790	4,470	603	2,200	1,030	1,720	1,540
3.....	327	155	213	535	1,780	665	2,970	637	1,360	1,030	1,540	1,330
4.....	278	126	226	565	1,420	615	1,480	615	1,080	1,140	1,300	1,170
5.....	305	162	210	565	2,210	665	1,200	615	1,220	1,540	1,660	1,080
6.....	238	413	238	590	1,840	665	1,000	590	1,600	1,720	1,660	1,030
7.....	155	425	258	865	1,300	590	1,000	465	1,360	1,540	1,300	1,360
8.....	273	295	319	892	1,110	665	1,100	448	1,300	1,480	1,300	1,720
9.....	258	285	302	715	975	3,040	1,100	443	2,040	2,800	1,300	2,820
10.....	275	298	278	615	865	1,960	1,000	461	4,830	5,380	8,580	2,480
11.....	269	229	271	540	892	1,300	950	445	3,100	2,400	20,500	1,600
12.....	255	281	258	506	840	1,170	850	365	2,220	5,800	13,500	1,170
13.....	235	353	229	484	765	1,200	850	394	2,150	8,920	8,630	948
14.....	190	281	264	540	690	1,800	1,000	456	1,360	5,010	5,420	790
15.....	236	248	369	525	640	3,100	1,100	966	1,170	3,280	3,780	690
16.....	223	241	369	506	590	2,820	1,100	1,060	1,250	3,440	2,890	665
17.....	216	316	425	470	555	1,900	1,100	765	4,350	3,680	3,640	665
18.....	188	245	1,470	421	992	1,480	1,100	615	5,930	2,890	5,070	640
19.....	167	248	892	403	3,380	1,220	1,000	535	4,190	2,410	2,940	565
20.....	164	238	867	385	2,480	1,060	1,000	413	2,480	2,020	2,890	525
21.....	135	213	2,570	416	1,900	975	950	515	2,080	1,900	13,200	484
22.....	136	181	1,420	530	1,660	920	1,000	540	1,840	1,840	22,000	815
23.....	128	168	1,030	488	1,420	1,720	1,200	545	1,540	1,480	23,800	615
24.....	130	133	865	421	1,220	1,720	1,660	590	1,250	2,020	14,400	474
25.....	216	140	765	385	1,060	2,310	1,900	565	1,140	2,480	12,700	425
26.....	145	140	715	399	948	2,280	1,360	615	1,030	2,080	8,860	461
27.....	131	140	892	565	840	1,540	1,140	615	975	2,410	5,630	665
28.....	153	140	1,000	665	765	1,220	975	615	1,110	2,540	3,910	1,200
29.....	181	140	790	690	740	1,080	865	......	1,300	2,820	2,820	865
30.....	163	140	640	892	815	920	815	......	1,170	2,220	2,220	715
31.....	164	140	......	3,710	......	865	740	......	1,280	......	2,020	......
Mean...	215	221	616	658	1.340	1.390	1.260	575	1,970	3,350	6,550	1,040

NOTE.— Mean discharge, August 26 to 30, estimated, 140 second-feet. Gage heights and discharge, December 1 to 7 and 14 to 16, estimated. Stage-discharge relation affected by ice, January 5 to 22. Discharge estimated by comparing with hydrograph of Genesee river at St. Helena and with hydrograph of sum of Genesee river at St. Helena, Canaseraga creek at Groveland Station and Keshequa creek at Craig Colony, Sonyea.

Monthly discharge of GENESEE RIVER AT JONES BRIDGE, NEAR MOUNT MORRIS' for the year ended June 30, 1919

[Drainage area, 1,400 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	365	130	215	0.152	0.18
August	425	126	221	0.157	0.18
September	2,570	140	616	0.437	0.49
October	3,710	385	658	0.470	0.54
November	3,380	555	1,340	0.956	1.07
December	3,100	590	1,390	0.992	1.14
January	4,470	740	1,260	0.900	1.04
February	1,060	365	575	0.411	0.43
March	5,930	975	1,970	1.41	1.63
April	15,800	1,030	3,350	2.39	2.67
May	23,800	1,300	6,550	4.68	5.40
June	2,820	425	1,040	0.743	0.83
The year	23,800	126	1,599	1.14	15.60

GENESEE RIVER AT GENESEE JUNCTION

Gage No. 227

This station, established May 14, 1917, is located at the mouth of Black creek, which enters the Genesee river from the west at Genesee Junction, about 5½ miles above the city of Rochester and just above the West Shore railroad bridge over the Genesee river. The gage, No. 227, a standard Type A gage, having a range of 18 feet, between elevations 510.0 and 528.0 (B. C. datum), is secured to the east wing of the north abutment of the Scottsville highway bridge over Black creek. The gage is read once daily — in the morning — to half-tenths.

Daily elevation of water-surface (B. C. datum) of GENESEE RIVER AT GENESEE JUNCTION, for the year ended June 30, 1919. J. Horton Begy, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	510.1	510.85	511.85	511.2	513.65	511.7	509.3	508.4	509.8	509.5	511.15	......
2......	510.1	511.0	511.9	511.2	513.8	511.6	509.6	508.3	509.9	509.25	510.9	......
3......	510.2	511.15	511.9	511.1	513.85	511.5	509.8	508.3	509.9	509.1	510.55	......
4......	510.2	511.4	511.8	511.1	513.85	511.5	509.85	508.0	509.5	508.9	510.0	......
5......	510.2	511.45	511.9	511.0	513.75	511.8	509.95	508.0	509.0	508.9	509.8	......
6......	510.1	511.5	511.9	511.2	513.4	512.4	509.9	508.0	509.3	509.0	510.5	......
7......	510.1	511.8	511.9	511.65	513.15	513.45	509.9	508.0	509.5	509.0	510.6	......
8......	510.1	511.9	512.0	511.8	512.85	513.8	509.9	508.0	510.9	509.75	......	......
9......	510.05	511.9	512.0	511.9	512.55	513.8	509.9	508.0	513.5	509.75	......	......
10......	510.05	511.85	512.0	511.8	512.2	513.5	509.75	508.0	513.1	511.1	......	......
11......	510.0	511.65	511.95	511.65	511.95	513.1	509.65	508.0	512.5	513.2	......	......
12......	510.0	511.65	511.9	511.65	511.85	512.8	509.5	508.0	511.85	517.3	......	......
13......	510.0	511.80	511.9	511.85	511.85	513.2	509.4	508.0	510.7	518.15	......	......
14......	510.0	511.9	511.9	511.85	511.8	513.4	509.25	508.0	510.45	516.5	......	......
15......	511.3	512.0	511.95	511.8	511.8	513.8	509.05	508.3	509.45	513.1	......	......
16......	511.5	511.9	512.05	511.8	511.75	518.95	509.05	508.3	509.45	511.1	......	......
17......	511.5	511.9	512.25	511.7	511.85	513.9	509.05	508.5	511.1	512.15	......	......
18......	511.5	511.85	512.25	511.55	511.9	513.1	509.0	508.5	512.5	512.15	......	......
19......	511.4	511.85	512.25	511.4	512.0	512.7	508.85	508.5	513.1	511.7	......	......
20......	511.4	511.8	512.25	511.4	512.15	512.05	508.8	508.5	514.0	511.7	......	......
21......	510.9	511.8	512.8	511.6	512.15	511.7	508.7	508.5	512.5	511.15	......	......
22......	510.15	511.8	512.6	511.8	512.15	511.1	508.7	508.4	510.9	510.8	......	......
23......	510.05	511.8	512.6	511.7	512.05	510.9	508.7	508.7	509.9	510.15	......	......
24......	510.0	511.7	512.3	511.7	512.0	510.8	508.7	508.9	509.65	510.15	......	......
25......	510.0	511.6	512.05	511.6	511.9	510.7	508.5	508.9	509.25	510.3	......	......
26......	510.0	511.55	511.85	511.6	511.9	510.4	508.5	509.2	509.1	510.3	......	512.0
27......	510.0	511.5	511.5	511.4	511.75	510.1	508.5	509.4	508.9	510.3	......	512.4
28......	510.1	511.65	511.25	511.5	511.75	509.6	508.5	509.6	508.9	510.7	......	512.4
29......	510.25	511.75	511.2	511.8	511.75	509.2	508.4	......	509.0	511.5	......	512.3
30......	510.4	511.6	511.2	512.4	511.75	508.8	508.4	......	509.0	511.5	......	512.25
31......	510.65	511.75	......	513.05	......	508.7	508.4	......	509.0	......	......	......

NOTE.— Gage taken down, bridge being repaired, May 8 to June 25.

GENESEE RIVER AT ELMWOOD AVENUE, ROCHESTER

Gage No. 218

Since the establishment of the Gurley automatic gage in December, 1910, reading of the staff gage once daily has been continued. Beginning in 1913, the gage heights from the automatic gage have been published in connection with the discharge, the water-surface elevations being continued as a separate table. In July, 1916, a standard Type A gage, No. 218, having a range of 16 feet, between elevations 507.0 and 523.0, was erected on the north, or downstream end of the east pier of the Elmwood avenue bridge. A standard bench-mark plug was placed in the north end of the same pier at elevation 520.0 (B. C. datum). This gage was read once daily — at 6 P. M. from July 1 to December 21 and at 5 P. M. from December 22 to June 30 — to half-tenths, with occasional hundredths.

Daily elevation of water-surface (B. C. datum) of GENESEE RIVER AT ELMWOOD AVE., ROCHESTER, for the year ended June 30, 1919. P. J. Slavin, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	507.8	507.25	507.25	507.7	509.95	*b*	506.8	506.0	*a*	507.0	509.01	508.9
2......	507.9	507.25	507.2	507.55	507.6	507.5	507.5	*a*	*a*	507.0	509.05	508.6
3......	508.0	507.0	507.25	*a*	508.35	507.0	509.5	*a*	506.8	507.5	509.0	508.4
4......	507.8	507.1	507.2	507.55	508.35	507.45	508.8	*a*	506.9	507.8	509.0	508.2
5......	507.9	507.05	507.15	507.2	508.25	507.3	508.0	*a*	507.7	507.8	509.0	508.1
6......	507.9	507.2	507.2	507.35	508.85	507.2	507.5	*a*	507.8	507.8	508.8	508.0
7......	507.9	507.3	507.15	507.3	508.35	507.35	507.2	*a*	506.9	507.9	509.5	508.0
8......	507.8	507.6	507.15	507.7	507.8	507.7	507.0	*a*	506.8	508.0	509.8	507.8
9......	507.8	507.6	507.2	507.75	507.8	508.15	507.0	*a*	507.2	508.0	510.6	*a*
10......	507.85	507.5	507.25	507.65	507.8	509.35	507.0	*a*	510.8	508.0	512.4	510.0
11......	507.85	507.1	507.15	507.45	507.35	507.85	507.0	*a*	510.4	509.8	514.5	509.5
12......	507.85	507.2	507.1	507.3	507.55	508.0	507.0	*a*	509.5	514.3	515.5	508.5
13......	507.85	507.3	*a*	507.3	507.65	508.0	507.0	*a*	509.0	512.6	515.5	508.2
14......	507.85	507.5	*a*	507.3	507.35	508.1	507.0	*a*	508.0	511.5	514.0	507.9
15......	507.85	507.6	507.0	507.2	507.45	508.7	507.0	*a*	507.2	509.4	511.5	507.6
16......	507.9	507.4	507.1	507.4	507.3	509.85	507.0	*a*	507.0	510.6	510.6	507.6
17......	507.8	507.4	507.0	507.35	507.2	508.65	507.0	*a*	508.0	510.1	510.4	507.6
18......	507.85	507.3	507.1	507.3	507.25	508.45	507.0	*a*	510.4	509.8	510.2	507.4
19......	507.85	507.35	508.05	507.15	508.1	508.35	507.0	*a*	511.4	509.4	510.8	507.4
20......	507.85	507.3	507.65	507.2	509.35	508.0	506.8	*a*	511.0	508.8	511.6	507.2
21......	507.75	507.3	508.1	507.2	508.7	507.5	506.4	*a*	510.2	508.4	513.5	507.1
22......	507.55	507.25	508.7	507.15	508.4	506.5	506.4	*a*	508.5	508.0	514.8	507.1
23......	507.75	507.2	508.35	507.25	508.35	506.5	506.4	*a*	508.0	508.0	516.1	507.0
24......	507.8	507.1	507.9	507.2	508.25	507.6	506.4	*a*	507.8	508.0	517.5	507.0
25......	507.65	507.1	507.8	507.2	508.0	507.6	506.4	*a*	507.4	509.6	517.2	507.0
26......	507.75	507.1	507.8	507.25	507.75	507.6	506.2	*a*	507.0	509.09	516.2	507.1
27......	507.5	506.45	507.8	507.2	507.7	507.6	506.2	*a*	507.0	509.05	514.5	507.3
28......	507.5	507.15	507.9	507.3	507.35	507.6	506.2	*a*	507.0	509.75	510.9	507.2
29......	507.65	507.1	508.05	507.55	507.55	506.9	506.0	......	507.0	509.09	510.4	507.0
30......	507.3	507.0	507.9	507.55	507.55	506.9	506.0	......	507.5	509.08	509.6	507.0
31......	507.35	507.1	......	507.7	......	506.9	506.0	......	507.5	......	509.4	......

a No record. *b* Reading doubtful..

GENESEE RIVER AT ROCHESTER

Location.—At the Elmwood avenue bridge at the north end of Genesee Valley park, 3¼ miles below the mouth of Black creek, 3½ miles above the center of the city of Rochester, Monroe county, and 7½ miles above the mouth of the river.

Drainage area.— 2,440* square miles.

Records available.— Discharge records, February 9, 1904, to September 30, 1918. Fragmentary records prior to this period published in Water-Supply Papers Nos. 24, 65 and 97. Gage-height records, October 1 to 10, 1918, and March 3 to June 7, 1919. Rating does not apply for these periods on account of Barge canal construction in progress in river channel.

Gage.— Gurley water-stage recorder installed in December, 1910, in the pump-house immediately below the bridge on the right bank. Recorder inspected by Geo. A. Bailey. Prior to December, 1910, a staff gage bolted to the downstream end of the first pier from the right abutment. Elevation of zero of gage, 506.848 (B. C. datum) or 245.591, Rochester city datum. Record suspended October 11, 1918, on account of dredging operations in river channel.

Vertical enameled staff gage installed March 3, 1919, above site of temporary dam, giving elevations referred to Barge canal datum; record obtained March 3 to June 7, 1919. Gage read by J. Bendon.

Discharge measurements.— Made from downstream side of Elmwood avenue bridge.

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* Revised area as computed by engineers of the State Conservation Commission. Formerly given as 2,360 square miles.

NOTE.— Due to Barge canal construction, discharge records ceased September 30, 1918, and the station was officially discontinued. Gage heights obtained after that date cannot be applied to rating table to give accurate estimates of discharge.

Discharge measurements of GENESEE RIVER AT ROCHESTER, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
		Feet	*Sec.-ft.*
1918			
July 12	E. D. Burchard	1.14	764
July 20	E. D. Burchard	1.20	675
July 27	E. D. Burchard	0.76	664
July 31	E. D. Burchard	0.60	666
Aug. 19	E. D. Burchard	0.49	597
Aug. 26	E. D. Burchard	0.40	512
Sept. 24	E. D. Burchard	1.21	1,580
Oct. 5	E. D. Burchard	0.77	1,050
Nov. 9	E. D. Burchard	1.07	1,540
1919			
Mar. 3	E. D. Burchard	*a* 508.61	2,300
Mar. 4	E. D. Burchard	*a* 508.37	1,830
April 5	J. W. Moulton	*a* 508.34	1,740
April 7	J. W. Moulton	*a* 508.58	2,240
April 8	J. W. Moulton	*a* 508.60	2,210
April 15	C. C. Covert	*a* 510.79	5,830
April 16	J. W. Moulton	*a* 509.86	4,130
April 17	J. W. Moulton	*a* 510.52	5,390
May 14 *b*	J. W. Moulton	*a* 514.6	16,100

a Barge canal datum. *b* Debris on control.

Daily gage height, in feet, of GENESEE RIVER AT ROCHESTER, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	DAY	July	Aug.	Sept.	DAY	July	Aug.	Sept.
1	1.14	0.42	0.41	11	1.17	0.42	0.41	21	1.03	0.43	1.25
2	1.20	0.42	0.41	12	1.14	0.43	0.41	22	0.69	0.43	2.03
3	1.21	0.42	0.41	13	1.17	0.42	0.41	23	0.84	0.41	1.61
4	1.23	0.42	0.41	14	1.11	0.42	0.41	24	1.04	0.41	1.33
5	1.23	0.43	0.41	15	1.17	0.65	0.41	25	1.00	0.41	1.11
6	1.25	0.45	0.41	16	1.23	0.61	0.41	26	0.97	0.41	1.04
7	1.19	0.78	0.41	17	1.17	0.56	0.41	27	0.74	0.41	0.99
8	1.08	0.95	0.41	18	1.18	0.54	0.5[illegible]	28	0.71	0.41	1.15
9	1.11	0.88	0.41	19	1.18	0.50	1.26	29	0.94	0.41	1.31
10	1.18	0.56	0.41	20	1.09	0.48	1.02	30	0.60	0.41	1.14
								31	0.58	0.41	......

Daily discharge, in second-feet, of GENESEE RIVER AT ROCHESTER, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	DAY	July	Aug.	Sept.	DAY	July	Aug.	Sept.
1	750	460	550	11	800	500	550	21	550	550	1,600
2	850	480	550	12	750	500	550	22	300	550	2,800
3	850	480	550	13	800	500	550	23	480	500	2,200
4	850	480	550	14	700	500	550	24	750	500	1,800
5	850	480	550	15	750	750	550	25	800	500	1,400
6	900	500	550	16	800	700	550	26	800	500	1,400
7	800	900	550	17	700	650	550	27	650	550	1,300
8	700	1,100	550	18	700	650	700	28	650	550	1,500
9	750	1,000	550	19	650	600	1,600	29	950	550	1,800
10	800	650	550	20	550	600	1,300	30	600	550	1,500
								31	650	550	......

NOTE.— Discharge, July 1 to September 30, determined by indirect method on account of dredging operations on the control.

Monthly discharge of GENESEE RIVER AT ROCHESTER, for the year ended June 30, 1919

[Drainage area, 2,440 square miles]

Month	Discharge in Second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	950	300	725	0.297	0.34
August	1,100	460	591	0.242	0.28
September	2,800	550	1,010	0.414	0.46

Daily gage height, in feet, of GENESEE RIVER AT ROCHESTER, for the year ended June 30, 1919

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.98						508.40	509.30	509.32
2	0.84						508.27	508.83	509.20
3	0.55					508.69	508.20	508.93	508.67
4	0.55					508.25	508.18	508.78	508.52
5	0.60					508.17	508.17	509.00	509.15
6	0.56					508.83	508.47	508.57	510.45
7	0.51					508.47	508.58	509.03	511.47
8	0.89					508.18	508.60	508.83	
9	1.05					508.55	508.65	508.72	
10	0.86					510.80	509.83	510.03	
11						510.73	512.77	516.65	
12						509.80	514.60	519.17	
13						509.17	514.47	520.+	
14						508.90	512.20	518.87	
15						508.32	510.53	515.23	
16						508.83	509.83	513.20	
17						509.15	510.48	511.57	
18						511.37	510.13	511.70	
19						511.45	509.45	512.93	
20						510.10	509.12	511.23	
21						509.17	508.85	513.97	
22						508.83	508.73	517.22	
23						508.65	508.63	520.00	
24						508.47	508.43	520.70	
25						508.15	509.23	520.92	
26						508.20	509.35	519.15	
27						508.13	509.42	516.95	
28						508.23	509.73	513.50	
29						508.23	509.83	511.10	
30						508.32	509.78	509.72	
31						508.30		509.62	

NOTE.— Gage height readings, October 1 to 10 (zero of gage, 506.848, B. C. datum). Water-surface elevations (B. C. datum), March 3 to June 7.

CANASERAGA CREEK

DESCRIPTION

Canaseraga creek, one of the most important tributaries to the Genesee river from the east, rises in the extreme northwestern corner of Steuben county and flows in a northwesterly direction to its junction with the Genesee river, a short distance below the village of Mount Morris.

Through its entire course the creek flows through a flat, fertile valley, devoted almost entirely to the pursuit of agriculture. From the village of Dansville to Mount Morris, the natural bed of the river originally wound back and forth across the valley. The velocity was so slow that the large amount of silt which was brought down from the foot hills by the smaller streams was deposited in the creek bed, raising it to an elevation higher, in many cases, than the surrounding country. The deposit of silt, coupled with the extreme deviation of the creek from a straight line caused the 11,000 acres, which border on the stream below Dansville, to become annually inundated by the flood waters.

During 1911 to 1915, inclusive, the channel was deepened, straightened, confined in part by levees, and the length of flow materially reduced from Cumminsville bridge, a mile north or downstream from the Dansville gaging station, to Shakers Crossing, about a mile above the junction with the Genesee river.

CANASERAGA CREEK NEAR DANSVILLE

Location.—At highway bridge 1 mile west of Dansville, Livingston county, 2,200 feet below mouth of Mill brook and about 22 miles above mouth of creek.

Drainage area.— 158 square miles, as determined by engineers of the State Conservation Commission. Formerly given as 167 square miles.

Records available.— July 21, 1910, to December 31, 1912; July 10, 1915, to June 30, 1917; March 10, 1919, to June 17, 1919, when the station was discontinued.

Gage.— Vertical staff at downstream side of left abutment. Gage read by C. W. Maloney.

Discharge measurements.— Made from bridge or by wading.

Channel and control.— Sand and gravel; shifting frequently.

Extremes of discharge.— Current year: Maximum stage recorded, 12 feet at 8 A. M., May 22; discharge, 3,500 second-feet. Minimum stage recorded, 6.2 feet several times in March; discharge, 120 second-feet.

1910–1912, 1915–1917, and 1919: Maximum stage recorded, 13.0 feet at 9.30 P. M., May 16, 1916; discharge, determined roughly from logarithmic extension of rating curve, 6,600 second-feet. Minimum stage recorded, 5.2 feet several times during October and November, 1916.

Ice.— Stage-discharge relation affected by ice.

Accuracy.— Rating curve not well defined. Gage read to half-tenths twice daily.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of CANASERAGA CREEK NEAR DANSVILLE, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
April 12	J. W. Moulton	8.04	943
April 12	J. W. Moulton	7.82	837
April 15	J. W. Moulton	6.70	262
May 13	J. W. Moulton	7.48	595
May 23	C. C. Covert	9.08	1,610
May 27	J. W. Moulton	7.42	462
June 12	J. W. Moulton	6.68	135

Daily discharge, in second-feet, of CANASERAGA CREEK NEAR DANSVILLE, for the year ended June 30, 1919

DAY	Mar.	April	May	June	DAY	Mar.	April	May	June
1		155	260	162	16	240	280	280	98
2		180	210	162	17	450	240	476	
3		139	175	148	18	586	210	340	
4		210	* 178	122	19	320	180	240	
5		260	180	* 122	20	210	155	280	
6		210	151	122	21	180	160	1,490	
7		210	145	193	22	168	139	* 2,630	
8		180	139	134	23	135	132	1,710	
9		280	210	592	24	131	360	1,620	
10	320	792	2,070	483	25	119	280	856	
11	240	1,400	1,680	162	26	115	210	536	
12	195	930	930	122	27	115	210	410	
13	155	450	614	122	28	119	240	301	
14	135	340	403	87	29	125	340	263	
15	135	260	320	98	30	131	280	227	
					31	151		193	

* Estimated by comparison with discharge at Cumminsville.

Monthly discharge of CANASERAGA CREEK NEAR DANSVILLE, for the year ended June 30, 1919

[Drainage area, 158 square miles]

Month	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
April	1,400	132	314	1.99	2.22
May	2,630	189	630	3.99	4.60

CANASERAGA CREEK AT CUMMINSVILLE

Location.— At bridge on State road in village of Cumminsville, Livingston county, about one mile downstream from station formerly maintained as "Canaseraga Creek near Dansville," about 1½ miles below Mill Brook and 21 miles above mouth of creek.

Drainage area.— 160* square miles. (Measured by State Conservation Commission.)

Records available.— October 23, 1917, to June 30, 1919, at this station; at station near Dansville, July 21, 1910, to December 31, 1912, and July 10, 1915, to December 29, 1917.

Gage.— Vertical staff, in three sections, on downstream face of bridge pier, graduated from 0 to 10.0. Read by George Freed.

Discharge measurements.— Made by wading below control at low and medium stages and from downstream side of bridge during high water.

Channel and control.— Rather well compacted gravel and small boulders; practically permanent between dates of shift, but liable to shift during severe floods.

Extremes of discharge.— Current year: Maximum stage recorded, 6.8 feet at 8:30 A. M., May 22; discharge, 6,540 second-feet. Minimum stage recorded, 0.70 foot several times in August and September, 1918; discharge, 21 second-feet.

1917–1919: Maximum stage recorded, 6.8 feet at 8:30 A. M., May 22, 1919; discharge, 6,540 second-feet. Minimum stage recorded, 0.70 foot several days in August and September, 1918; discharge, 21 second-feet.

* Revised area as computed by engineers of the State Conservation Commission. Formerly given as 171 square miles.

Ice.— Stage-discharge relation affected by ice.

Accuracy.— Stage-discharge relation probably permanent between dates of shift. Affected by ice during a large part of the period from December to March. Gage read to tenths twice daily.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of CANASERAGA CREEK AT CUMMINSVILLE, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 15	E. D. Burchard	0.89	38.2
Aug. 23	E. D. Burchard	0.77	24.7
1919			
Jan. 25	E. D. Burchard	1.07	61.0
Mar. 31	J. W. Moulton	1.39	138
June 13	J. W. Moulton	1.17	116
June 13	J. W. Moulton	1.16	121
June 23	J. W. Moulton	1.00	80.6

Daily gage height, in feet, of CANASERAGA CREEK AT CUMMINSVILLE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.90	0.90	0.70	0.90	1.05	0.80	1.20	1.00	2.15	1.30	1.50	1.40
2	0.90	0.90	0.70	0.90	0.90	0.80	2.00	1.10	1.70	1.30	1.49	1.30
3	0.85	0.90	0.70	0.85	0.90	0.80	1.50	1.00	1.55	1.35	1.48	1.30
4	0.80	0.80	0.70	0.80	0.90	0.80	1.00	0.90	1.40	1.60	1.48	1.20
5	0.80	0.85	0.75	0.80	0.90	0.80	1.00	0.90	1.40	1.61	1.47	1.20
6	0.80	0.80	0.80	0.90	0.90	0.80	1.00	0.90	1.30	1.61	1.40	1.20
7	0.80	0.80	0.80	0.90	0.90	0.90	1.00	0.90	1.30	1.58	1.38	1.20
8	0.80	0.80	0.80	0.90	0.90	1.10	1.00	0.80	1.30	1.48	1.35	1.29
9	0.85	0.80	0.80	0.90	0.90	1.50	1.10	0.90	1.95	1.78	1.31	1.90
10	1.00	0.80	0.80	0.90	0.90	1.20	1.25	0.90	1.70	2.8	3.2	1.74
11	1.00	1.00	0.80	0.80	0.90	1.00	1.30	0.85	1.60	3.2	2.9	1.55
12	0.90	0.95	0.80	0.80	0.90	1.00	1.20	0.80	1.50	2.8	2.5	1.41
13	0.90	0.80	0.90	0.90	0.85	0.90	1.20	0.80	1.40	2.3	2.1	1.25
14	0.90	0.80	0.80	0.90	0.80	0.90	1.35	0.90	1.40	1.80	1.75	1.16
15	0.90	0.80	0.80	0.90	0.80	0.95	1.30	0.90	1.40	1.61	1.59	1.10
16	0.90	0.80	0.90	0.80	0.80	1.00	1.20	0.90	1.40	1.68	1.59	1.10
17	0.85	0.80	1.00	0.80	0.85	0.90	1.20	0.90	1.40	1.64	1.61	1.08
18	0.90	0.80	0.90	0.80	1.55	0.90	1.20	0.85	1.35	1.5	1.52	1.15
19	0.90	0.80	0.80	0.80	1.45	0.90	1.10	0.80	1.40	1.43	1.46	1.09
20	0.90	0.80	1.40	0.80	1.30	0.90	1.10	0.85	1.40	1.40	1.42	1.07
21	0.80	0.70	1.10	0.90	1.20	0.90	1.10	0.90	1.35	1.41	3.3	1.00
22	0.80	0.70	0.95	0.85	1.20	0.90	1.10	0.90	1.30	1.38	4.8	1.00
23	0.80	0.70	0.90	0.80	1.00	1.25	1.10	1.00	1.30	1.30	3.4	1.00
24	0.80	0.70	0.90	0.80	1.00	1.35	1.00	1.00	1.30	2.0	2.9	1.00
25	1.00	0.70	0.90	0.80	1.00	1.25	0.95	1.00	1.32	1.75	2.6	0.96
26	0.95	0.70	0.90	0.80	0.90	1.30	0.90	1.00	1.32	1.60	2.35	1.10
27	0.90	0.70	0.90	0.80	0.90	1.20	0.90	1.00	1.24	1.65	1.90	1.45
28	0.90	0.70	0.90	0.80	0.90	1.20	0.90	1.00	1.25	1.61	1.68	1.25
29	0.90	0.70	0.90	0.80	0.90	1.20	0.90	......	1.23	1.66	1.60	1.15
30	1.00	0.70	0.90	0.85	0.90	1.15	0.90	......	1.29	1.57	1.52	1.05
31	0.90	0.80	......	1.35	......	1.10	0.90	......	1.41	......	1.47	......

Daily discharge, in second-feet, of CANASERAGA CREEK AT CUMMINSVILLE, for the year ended June 30, 1918

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	......	324	82	140	40	520	153	71	116
2	......	286	82	140	34	491	153	68	90
3	......	222	82	200	34	462	153	66	66
4	......	196	86	140	40	378	145	66	66
5	......	201	84	120	40	406	122	66	66
6	......	196	82	120	34	645	122	66	66
7	......	184	82	90	46	434	138	63	66
8	......	141	80	55	40	491	157	122	66
9	......	141	100	55	40	406	157	90	66
10	......	130	85	65	40	1,080	130	116	66
11	......	126	85	55	120	434	116	142	58
12	......	123	80	100	700	925	119	122	161
13	......	116	75	90	650	815	142	122	106
14	......	110	110	55	580	2,190	350	122	90
15	......	113	90	55	1,170	815	491	100	66
16	......	104	85	55	462	406	406	90	49
17	......	104	85	45	294	378	294	76	49
18	......	104	85	30	294	245	434	76	49
19	......	107	160	34	1,080	245	305	73	36
20	......	95	150	40	2,080	265	224	103	36
21	......	89	116	38	350	279	289	122	36
22	......	107	116	40	294	367	241	122	49
23	......	110	110	40	294	279	178	122	49
24	......	101	126	40	294	224	153	161	49
25	......	92	172	55	322	165	153	138	49
26	......	86	150	46	1,130	130	122	122	42
27	......	86	190	40	678	126	109	122	36
28	853	86	140	32	350	122	90	112	36
29	1,060	82	160	30	......	145	90	122	36
30	1,060	82	190	34	......	145	80	138	36
31	658	......	160	40	......	153	......	122	......
Mean	......	135	112	68.4	412	457	194	104	61.7

Daily discharge, in second-feet, of CANASERAGA CREEK AT CUMMINSVILLE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	36	36	21	36	58	27	90	49	550	122	202	207
2	36	36	21	36	36	27	460	66	294	122	198	165
3	32	36	21	32	36	27	202	49	224	142	194	165
4	27	27	21	27	36	27	49	36	161	245	194	128
5	27	32	24	27	36	27	49	36	161	250	190	128
6	27	27	27	36	36	27	49	36	122	250	161	128
7	27	27	27	36	36	36	49	36	122	236	153	128
8	27	27	27	36	36	66	49	27	122	194	142	161
9	32	27	27	36	36	202	66	36	430	339	126	470
10	49	27	27	36	36	90	106	36	294	1,000	1,350	378
11	49	49	27	27	36	49	122	32	245	1,350	1,080	278
12	36	42	27	27	36	49	90	27	202	1,000	780	212
13	36	27	36	36	32	36	90	27	161	645	520	146
14	36	27	27	36	27	36	142	36	161	350	322	115
15	36	27	27	36	27	42	122	36	161	250	241	96

Daily discharge, in second-feet, of CANASERAGA CREEK AT CUMMINSVILLE, for the year ended June 30, 1919—*Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
16.....	36	27	36	27	27	49	90	36	200	284	241	96
17.....	32	27	49	27	32	36	90	36	400	265	250	91
18.....	36	27	36	27	224	36	90	32	580	202	211	112
19.....	36	27	27	27	182	36	66	27	350	173	186	94
20.....	30	27	161	27	122	36	66	32	220	161	169	88
21.....	27	21	66	36	90	36	66	36	160	165	1,450	71
22.....	27	21	42	32	90	36	66	36	122	153	3,210	71
23.....	27	21	36	27	49	106	66	49	122	122	1,550	71
24.....	27	21	36	27	49	142	49	49	122	460	1,190	71
25.....	49	21	36	27	49	106	42	49	130	322	940	65
26.....	42	21	36	27	36	122	36	49	130	245	755	96
27.....	36	21	36	27	36	90	36	49	103	270	470	230
28.....	36	21	36	27	36	90	36	49	106	250	345	146
29.....	36	21	36	27	36	90	36	......	100	274	303	112
30.....	49	21	36	32	36	78	36	......	119	232	263	84
31.....	36	27	......	142	......	66	36	......	165	......	239	......
Mean...	34.9	27.3	36.4	34.4	54.5	62.0	85.2	39.1	211	336	569	147

NOTE.— Discharge estimated, March 16 to 21, on basis of discharge of Canaseraga creek at Dansville and at Groveland Station.

Monthly discharge of CANASERAGA CREEK AT CUMMINSVILLE, for the 20 months ended June 30, 1919

[Drainage area, 160 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
November..........................	324	82	135	0.844	0.94
December..........................	190	75	112	0.700	0.81
January..........................	200	30	68.4	0.428	0.49
February..........................	2,080	34	412	2.58	2.69
March..........................	2,190	122	457	2.86	3.30
April..........................	491	80	194	1.21	1.35
May..........................	161	63	104	0.650	0.75
June..........................	161	36	61.7	0.386	0.43
July..........................	49	27	34.9	0.204	0.24
August..........................	49	21	27.3	0.154	0.18
September..........................	161	21	36.4	0.213	0.24
October..........................	142	27	34.4	0.215	0.25
November..........................	224	27	54.5	0.341	0.38
December..........................	202	27	62.0	0.388	0.45
January..........................	460	36	85.2	0.532	0.61
February..........................	66	27	39.1	0.244	0.25
March..........................	580	100	211	1.32	1.52
April..........................	1,350	122	336	2.10	2.34
May..........................	3,210	126	569	3.56	4.10
June..........................	470	65	147	0.919	1.03
The year..........................	3,210	21	136	0.85	11.59

CANASERAGA CREEK AT GROVELAND STATION

Location.— At highway bridge at Groveland Station, Livingston county.

Drainage area.— 184* square miles. Measured by engineers of the New York State Conservation Commission.

Records available.— August 5, 1915, to September 30, 1916; March 1, 1917, to June 30, 1919.

Gage.— Chain gage near center of downstream side of bridge. Prior to March 30, 1916, inclined staff on right bank about 400 feet above bridge, at practically same datum, 560.00 (Conservation Commission datum); read by Thomas Maimone.

Discharge measurements.— Made from highway bridge or by wading.

Channel and control.— Creek flows through improved channel, which is in gravel and is likely to shift.

Extremes of discharge.— Maximum stage recorded during fifteen month period, 18.05 feet at 9:20 A. M., May 22; discharge, 4,380 second-feet. Minimum stage recorded, 6.3 feet several times in August and November, 1918; discharge, 19 second-feet.

1915–1919: Maximum stage recorded, May 22, 1919; discharge, 4,380 second-feet. Minimum stage recorded, 6.3 feet in August and November, 1918; discharge, 19 second-feet.

Ice.— Stage-discharge relation affected by ice.

Accuracy.— Stage-discharge relation permanent; usually affected by ice, December to March. Rating curve well defined between 35 and 3,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except those for floods of several days' duration, when stage-discharge relation may be affected by backwater.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

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* Revised area as computed by engineers of the State Conservation Commission. Formerly given as 195 square miles.

Discharge measurements of CANASERAGA CREEK AT GROVELAND STATION, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 15	E. D. Burchard	6.64	36
Aug. 24	E. D. Burchard	6.52	29
1919			
Jan. 25	E. D. Burchard	7.32	102
Mar. 31	J. W. Moulton	7.80	167
Apr. 12	J. W. Moulton	12.23	1,020
Apr. 12	J. W. Moulton	11.62	893
Apr. 13	J. W. Moulton	10.01	557
May 13	O. W. Hartwell	10.71	680
May 23	O. W. Hartwell	13.76	1,610
May 24	O. W. Hartwell	12.80	1,190
May 25	J. W. Moulton	12.27	1,080
May 26	J. W. Moulton	10.55	649
May 27	J. W. Moulton	9.84	510
June 11	J. W. Moulton	8.16	192
June 23	J. W. Moulton	7.19	82

Daily gage height, in feet, of CANASERAGA CREEK AT GROVELAND STATION, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	6.8	6.6	6.35	6.68	8.0	6.80	8.0	6.88	9.4	7.7	8.5	8.2
2	6.7	6.6	6.42	6.60	7.6	6.98	8.9	7.05	7.6	7.55	8.5	8.1
3	6.7	6.6	6.42	6.72	7.35	6.88	7.85	6.82	7.4	7.95	8.3	8.0
4	*a*	6.65	6.48	6.62	7.3	6.80	7.4	7.0	7.4	8.5	8.1	7.85
5	*a*	6.6	6.7	6.60	7.35	6.85	7.25	6.90	7.5	8.3	8.0	7.7
6	6.65	6.55	6.7	7.0	7.3	6.98	7.4	6.85	7.6	8.0	7.9	7.95
7	6.65	6.5	*a*	7.2	7.4	*a*	7.5	6.98	7.65	8.2	7.8	8.5
8	6.7	6.5	*a*	7.0	7.35	6.08	7.55	7.02	7.7	8.0	7.8	8.8
9	6.9	7.1	*a*	6.88	7.0	8.4	7.45	6.88	*a*	8.6	7.8	9.9
10	7.15	6.6	*a*	6.78	6.85	7.9	7.05	6.85	9.1	11.4	13.9	8.7
11	6.9	6.6	*a*	6.68	6.60	7.8	7.2	6.78	8.6	13.5	14.0	8.2
12	6.8	6.6	*a*	6.62	6.35	7.6	7.35	*a*	8.1	12.4	12.2	7.9
13	6.7	6.6	*a*	6.62	*a*	7.4	7.6	*a*	8.2	9.3	10.6	7.7
14	6.65	6.5	*a*	6.58	*a*	8.1	7.6	*a*	7.4	*a*	9.6	7.4
15	6.65	6.5	*a*	6.52	*a*	8.7	7.9	*a*	7.55	*a*	9.0	7.5
16	6.6	6.5	*a*	6.58	6.32	8.0	7.6	6.90	8.0	*a*	8.7	7.5
17	6.75	6.42	*a*	6.62	6.70	7.65	7.6	6.90	9.7	*a*	10.1	7.8
18	6.8	6.45	6.7	6.58	7.8	7.4	7.4	6.92	10.2	*a*	9.1	7.5
19	6.6	6.48	7.25	6.65	8.3	7.3	7.3	7.1	9.2	*a*	8.6	7.3
20	6.5	6.32	7.8	*a*	7.7	7.2	7.35	7.15	9.0	8.2	9.0	7.4
21	6.55	6.5	7.15	*a*	7.6	7.1	7.2	6.88	7.9	8.0	14.4	7.3
22	6.55	6.5	6.9	*a*	7.4	7.05	7.1	6.85	7.6	7.9	15.8	7.25
23	6.55	6.5	6.8	*a*	7.2	7.65	7.4	7.0	7.5	7.65	14.4	7.2
24	6.7	6.48	6.8	*a*	7.0	*a*	8.0	6.92	7.4	9.7	13.2	7.2
25	7.1	6.48	6.7	*a*	7.1	*a*	7.4	6.82	7.3	8.6	12.0	7.7
26	6.8	6.45	6.75	*a*	6.98	*a*	7.35	6.78	7.3	8.5	10.7	7.9
27	6.7	6.48	6.8	*a*	6.92	*a*	7.4	6.88	7.4	8.7	9.9	7.5
28	6.6	6.38	6.75	*a*	6.82	*a*	7.1	7.05	7.5	8.8	9.3	*a*
29	6.6	6.38	6.7	*a*	6.82	7.3	7.1	......	7.6	9.1	9.1	7.3
30	6.7	6.32	6.7	*a*	6.92	7.3	7.1	......	7.6	8.6	8.8	7.1
31	6.6	6.38	......	8.9	......	7.4	6.88	......	7.75	......	8.4	......

a No record.

Daily discharge, in second-feet, of CANASERAGA CREEK AT GROVELAND STATION, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	42	32	24	39	196	48	196	54	429	152	275	227
2.....	40	32	26	33	138	63	341	70	138	132	275	211
3.....	38	32	26	42	106	54	174	50	112	188	243	196
4.....	38	34	28	34	100	48	112	65	112	275	211	174
5.....	36	32	36	33	106	52	94	56	125	243	196	152
6.....	36	30	36	65	100	63	112	52	138	196	181	188
7.....	36	28	36	88	112	63	125	63	145	227	166	275
8.....	36	28	36	65	106	63	132	67	152	196	166	324
9.....	48	60	36	54	65	259	118	54	500	291	166	525
10.....	70	32	36	46	52	181	70	52	375	835	1,680	307
11.....	50	32	36	39	33	166	88	46	291	1,480	1,740	227
12.....	42	32	36	34	25	138	106	50	211	1,060	1,020	181
13.....	38	32	36	34	25	112	138	48	227	411	660	152
14.....	36	28	36	32	25	211	138	60	112	370	466	112
15.....	36	28	36	29	25	307	181	90	132	300	358	125
16.....	34	28	36	32	25	196	138	56	196	340	307	125
17.....	40	26	36	34	40	145	138	56	485	300	560	166
18.....	42	26	36	32	166	112	112	58	580	240	375	125
19.....	36	28	80	36	243	100	100	76	393	210	291	100
20.....	32	22	150	35	152	88	106	82	358	227	358	112
21.....	32	28	65	40	138	76	88	54	181	196	1,950	100
22.....	32	28	46	40	112	70	76	54	138	181	2,790	94
23.....	32	28	40	45	88	145	112	65	125	145	1,950	88
24.....	40	28	40	45	65	240	196	58	112	485	1,350	88
25.....	65	28	36	45	76	340	112	50	100	291	970	152
26.....	42	26	38	45	63	180	106	46	100	275	680	181
27.....	36	28	40	45	58	140	112	54	112	307	525	125
28.....	34	24	38	50	50	110	76	70	125	824	411	112
29.....	34	24	36	115	50	100	76	......	138	375	375	100
30.....	40	22	36	250	58	100	76	......	138	291	324	76
31.....	36	24	......	341	......	112	54	......	159	......	259	......
Mean...	39.6	29.4	41.8	61.2	86.6	132	123	59.1	214	351	686	171

NOTE.— Mean discharge, September 7 to 17, estimated, 36 second-feet. Discharge estimated on basis of discharge of Canaseraga creek at Cumminsville for the following dates: October 20 to 30, November 12 to 16, December 7, 24 to 28, February 12 to 15, March 9 and April 14 to 19. Stage-discharge relation not affected by ice.

Monthly discharge of CANASERAGA CREEK, AT GROVELAND STATION, for the year ended June 30, 1919

[Drainage area, 184 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	70	32	39.6	0.203	0.23
August	60	22	29.4	0.151	0.17
September	150	24	41.8	0.214	0.24
October	341	29	61.2	0.333	0.38
November	243	25	86.6	0.471	0.53
December	340	48	132	0.718	0.83
January	341	54	123	0.668	0.77
February	90	46	59.1	0.321	0.33
March	580	100	214	1.16	1.34
April	1,480	132	351	1.90	2.12
May	2,790	166	686	3.73	4.30
June	525	76	171	0.930	1.04
The year	2,790	22	166	0.90	12.28

CANASERAGA CREEK AT SHAKERS CROSSING, NEAR MOUNT MORRIS

Location.— At highway bridge at Shakers Crossing, about 1 mile above mouth and 1¼ miles northeast of Mount Morris, Livingston county.

Drainage area.— 335* square miles. (Measured by engineers of the State Conservation Commission.)

Records available.— Occasional current-meter measurements, 1904 to 1915; continuous record of gage height and occasional current-meter measurements, July 13, 1915, to June 30, 1919.

Gage.— Gurley 7-day graph water-stage recorder, on the left bank, just below the bridge. Datum of gage same as that for gage on Genesee river at Jones bridge near Mount Morris, established July 12, 1915, 540.00 (Conservation Commission datum). Recorder inspected by Mrs. Wm. Russell.

Discharge measurements.— Made from the highway bridge during medium and high stages and by wading during low stages.

Channel and control.— Firm gravel; not likely to shift; subject to backwater from Genesee river.

Extremes of stage.— Current year: Maximum stage from water-stage recorder, 27.2 feet at 3 A. M., May 23. Minimum stage from water-stage recorder, 7.86 feet at 6 P. M., August 31.

1915–1919: Maximum stage from water-stage recorder, 28.92 feet at 1 P. M., May 17, 1916. Minimum stage from water-stage recorder, 7.86 feet at 6 P. M., August 31, 1918.

Ice.— Stage-discharge relation affected by ice.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Data on extent and duration of backwater from Genesee river too meager to permit accurate determination of discharge.

* Revised area as computed by engineers of the State Conservation Commission. Formerly given as 347 square miles.

Discharge measurements of CANASERAGA CREEK AT SHAKERS CROSSING, NEAR MOUNT MORRIS, during the year ended June 30, 1919

DATE	Made by	Gage height	Dis-charge
1918		*Feet*	*Sec.-ft.*
July 15	E. D. Burchard	8.70	157
1919			
Mar. 4	E. D. Burchard	9.19	256
Apr. 1	J. W. Moulton	9.38	301
Apr. 14	J. W. Moulton	12.87	1,100
Apr. 16	J. W. Moulton	11.30	719
May 13 a	J. W. Moulton	17.22	3,180
May 23 a	C. S. De Golyer	16.88	6,360
May 26	J. W. Moulton	19.18	3,720
June 13	J. W. Moulton	9.32	316

a Considerable backwater from Genesee river.

Daily gage height, in feet, of CANASERAGA CREEK AT SHAKERS CROSSING, NEAR MOUNT MORRIS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	8.63	8.22	8.29	8.64	10.98	8.80	9.06	8.76	9.75	9.45	10.07	9.83
2	8.61	8.18	8.29	8.64	......	8.76	12.36	8.84	9.75	9.37	10.15	9.41
3	8.54	8.16	8.23	8.64	......	8.76	10.25	9.00	9.12	9.49	9.80	9.59
4	8.40	8.00	8.26	8.65	......	8.81	9.18	8.94	9.14	9.83	9.53	9.46
5	8.52	8.20	8.18	8.50	......	8.93	9.59	8.80	9.30	10.21	9.87	9.45
6	8.41	8.32	8.35	8.90	......	8.94	9.85	8.75	9.47	10.03	9.72	9.49
7	8.42	8.26	8.36	9.27	......	9.00	9.46	8.85	9.26	9.94	9.47	10.13
8	8.46	8.20	8.49	9.11	......	9.06	9.34	8.84	9.33	9.81	9.43	9.84
9	8.37	8.36	8.48	8.99	......	10.94	9.57	8.76	10.32	10.87	9.60	11.97
10	8.59	8.36	8.45	8.96	......	9.79	9.97	8.71	10.91	13.41	17.08	10.78
11	8.61	8.39	8.45	8.92	......	9.16	10.06	8.81	11.19	19.18	25.07	9.72
12	8.54	8.41	8.37	8.88	......	9.16	......	8.75	10.28	21.57	21.88	9.51
13	8.50	8.50	8.25	8.87	8.70	9.16	......	8.76	10.15	16.25	18.01	9.38
14	8.49	8.46	8.49	8.82	8.55	9.64	......	8.76	9.41	13.60	14.65	9.19
15	8.49	8.41	8.61	8.78	8.90	10.80	......	9.11	9.49	11.33	12.33	9.12
16	8.37	8.40	8.51	8.83	8.89	10.55	......	8.85	9.75	11.46	11.27	9.09
17	8.32	8.44	8.95	8.83	8.85	9.66	......	8.85	12.66	11.48	12.09	9.26
18	8.27	8.42	9.02	8.74	9.55	9.32	......	8.79	14.01	10.70	12.84	9.07
19	8.21	8.41	8.56	8.76	11.08	9.13	9.23	8.84	12.10	10.25	10.95	8.99
20	8.16	8.30	8.96	8.90	10.01	9.03	9.15	9.00	10.47	9.68	11.09	9.02
21	8.16	8.20	9.95	8.86	9.59	8.98	9.08	8.84	10.10	9.85	19.68	8.96
22	8.05	8.15	8.64	8.76	9.37	8.94	9.12	8.82	9.77	9.65	25.63	8.90
23	8.07	8.14	8.75	8.74	9.20	9.50	9.30	8.81	9.42	9.37	26.48	8.73
24	8.05	8.16	8.91	8.70	9.05	9.46	9.75	8.82	9.34	......	24.52	8.82
25	8.53	8.20	8.71	8.70	8.95	10.45	9.50	8.91	9.21	......	22.61	8.81
26	8.22	8.22	8.70	8.75	8.89	10.16	9.26	8.83	9.22	......	18.67	8.91
27	8.16	8.15	8.74	8.86	8.83	9.41	9.01	8.82	9.24	10.49	14.93	9.21
28	8.14	8.09	8.78	8.87	8.80	9.18	8.88	9.16	9.45	10.66	12.56	9.20
29	8.20	8.07	8.70	8.84	8.80	9.12	8.91	......	9.58	11.15	11.12	......
30	8.17	8.15	8.66	8.89	8.87	8.98	8.82	......	9.38	10.46	10.51	......
31	8.20	8.09	......	11.67	......	8.85	8.80	......	9.70	......	10.15	......

NOTE.—Water-gage recorder not in operation, November 2 to 12, January 12 to 18 and Apri 24 to 26. Intake obstructed by silt, June 29 and 30; gage-height record uncertain.

KESHEQUA CREEK

DESCRIPTION

Keshequa creek, the principal tributary to Canaseraga creek, has its source among the hills of northern Allegany county and flows north and northeast through Nunda and Tuscarora, joining Canaseraga creek near Sonyea, the home of the Craig Colony for Epileptics. Throughout its length of some 20 miles it flows through a narrow valley and falls about 1,200 feet. No power is developed, as the flow during the summer averages only 3 to 6 second-feet. The yearly rainfall is a little above the average for the Genesee valley and ranges from 28 to 36 inches.

KESHEQUA CREEK AT CRAIG COLONY, NEAR SONYEA

Location.— About 200 feet downstream from private highway bridge on grounds of Craig Colony at Sonyea, Livingston county.

Drainage area.— 70* square miles. (Measured by the State Conservation Commission.)

Records available.— October 31, 1917, to June 30, 1919. Records were obtained from July 22, 1910, to December 31, 1912, at a site about 200 feet upstream, and from August 29, 1915, to October 31, 1917, at a station about one mile downstream, near the D. L. & W. railroad bridge.

Gages.— Vertical staff gage in three sections on retaining wall on left bank, just above control, graduated from 0 to 10.1, installed October 27, 1917. Read by A. J. Porter.

Discharge measurements.— Low-water measurements made by wading above the gage. High-water measurements made from downstream side of bridge.

Control.— Double-crested concrete weir built by Craig Colony for maintaining water-level for their pumping plant; permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 5.9 feet at 10 A. M., May 22; discharge, 5,940 second-feet. Mini-

* Revised area as computed by engineers of the State Conservation Commission. Formerly given as 69 square miles.

mum stage recorded, 0.13 foot at 8 A. M., August 20; discharge, 0.72 second-feet.

1917–1919: Maximum stage recorded, 5.9 feet, May 22, 1919; discharge, 5,940 second-feet. Minimum stage recorded, 0.13 foot at 8 A. M., August 20, 1918; discharge, 0.72 second-foot.

Ice.— Stage-discharge relation slightly affected by ice.

Accuracy.— Stage-discharge relation permanent. Rating curve well defined from 0 to 450 second-feet. Gage read to hundredths twice daily. Daily discharge determined by applying mean daily gage height to rating table. Results good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of KESHEQUA CREEK AT CRAIG COLONY, SONYEA, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 15	E. D. Burchard	0.30	3.42
Aug. 21	E. D. Burchard	0.19	1.26
1919			
Jan. 25	E. D. Burchard	0.72	28.1
Apr. 1 *a*	J. W. Moulton	0.60	16.5
Apr. 14	J. W. Moulton	1.60	251
Apr. 15	J. W. Moulton	0.99	67.8
May 13	J. W. Moulton	1.45	205
May 23	O. W. Hartwell	1.74	317
May 27	J. W. Moulton	1.07	86.1
June 11	J. W. Moulton	0.84	45.3
June 13	J. W. Moulton	0.68	24.9
June 23	J. W. Moulton	0.45	9.98

a Some shore ice.

Daily discharge, in second-feet, of KESHEQUA CREEK AT CRAIG COLONY, SONYEA, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	7.0	5.6	1.8	5.6	33	8.6	20	9.6	56	18	56	28
2	7.5	3.8	2.6	5.9	24	15	88	8.2	21	23	54	26
3	9.3	3.2	3.0	7.0	22	11	34	9.6	22	25	40	23
4	5.6	2.6	2.2	7.8	18	9.6	11	12	21	33	37	19
5	4.8	4.1	3.0	6.3	35	12	26	11	33	45	51	30
6	5.6	6.3	6.3	4.5	23	12	35	9.6	26	34	38	22
7	3.8	5.2	3.0	30	17	8.6	38	10	16	40	30	97
8	4.1	2.3	2.2	18	15	13	30	9.6	17	36	28	90
9	3.8	15	3.0	11	13	48	23	8.6	142	90	37	290
10	6.3	7.5	2.5	8.6	13	22	18	5.6	102	234	1,080	70
11	7.5	6.3	2.0	7.8	12	18	15	7.8	77	660	590	40
12	4.8	2.4	1.4	7.4	10	17	16	9.1	54	258	325	33
13	3.4	7.0	3.0	8.2	11	20	17	8.2	56	142	176	25
14	4.1	3.0	4.8	8.6	11	41	23	12	20	100	95	21
15	3.4	2.0	3.8	8.2	8.6	70	30	25	28	68	70	26
16	4.5	2.2	3.4	7.8	8.6	48	21	11.0	47	110	60	20
17	4.1	1.6	14	7.0	8.6	28	21	11.0	164	79	120	18
18	4.8	3.0	9.3	6.6	17	23	20	8.6	187	61	86	15
19	3.0	2.0	13	4.8	33	19	23	9.6	72	48	56	13
20	2.4	0.8	21	6.3	19	15	17	8.6	50	51	154	10
21	2.2	1.3	15	9.1	16	17	18	13	45	45	660	12
22	2.6	1.4	5.2	9.1	16	16	21	13	36	33	1,850	9.1
23	2.6	1.4	6.3	8.6	15	26	30	17	28	28	362	10
24	3.0	1.1	4.8	8.6	13	22	58	15	35	128	263	7.4
25	15	1.0	7.5	8.6	12	79	34	14	24	77	204	9.6
26	5.9	0.9	7.0	7.0	11	40	23	13	23	72	105	12
27	3.4	1.0	8.8	9.6	9.1	25	19	9.6	23	90	86	17
28	1.8	1.4	7.0	9.6	6.6	20	16	11	33	77	63	14
29	9.3	1.2	6.3	14	10	17	17	......	25	110	50	11
30	9.8	1.0	5.6	50	12	14	18	......	30	65	40	11
31	9.8	2.4	......	86	......	15	12	......	37	......	35	......
Mean	5.32	3.23	5.96	12.8	15.7	24.0	25.4	11.1	50.0	96.0	223	34.3

NOTE.— Stage-discharge relation not affected by ice. Discharge estimated, October 24 and 30, and December 1 to 3, by comparing with hydrographs of Canaseraga creek at Cumminsville and Groveland Station.

Monthly discharge of KESHEQUA CREEK AT CRAIG COLONY, SONYEA, for the year ended June 30, 1919

[Drainage area, 70 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	15	1.8	5.32	0.077	0.09
August	15	0.8	3.23	0.047	0.05
September	21	1.4	5.96	0.086	0.10
October	86	4.5	12.8	0.183	0.21
November	35	6.6	15.7	0.224	0.25
December	79	8.6	24.0	0.343	0.40
January	88	11	25.4	0.363	0.42
February	25	5.6	11.1	0.159	0.17
March	187	16	50.0	0.714	0.82
April	660	18	96.0	1.37	1.53
May	1,850	28	223	3.19	3.68
June	290	7.4	34.3	0.490	0.55
The year	1,850	0.8	42.2	0.60	8.27

BARGE CANAL

BARGE CANAL NEAR SOUTH GREECE

Location.— Slope station between South Greece and Genesee river. The old Erie canal takes water from the Barge canal at South Greece. There is practically no diversion of water from the new canal from this point to the Genesee river, a distance of about 5 miles. The canal flows through a rock cut for nearly the entire distance.

Records available.— Gage heights and occasional discharge measurements from July 31, 1918, to June 30, 1919, except during winter season, when canal is closed.

Gages.— Two Gurley 7-day water-stage recorders with natural scale for gage heights. The float wells are 18 inches by 30 inches inside dimensions with the bottoms about 2 feet below normal canal level.

Gage No. 1 is located on the left bank near the spillway just below the junction lock at South Greece; inspected by the gate-keeper at the lock.

Gage No. 2 is located on the right bank just west of the upper gate in the guard-lock; inspected by the lock-tender.

Discharge measurements.— Made from the steel highway bridge just below gage No. 1. Occasional measurements at the guard-lock near gage No. 2.

Determination of discharge.— The field data have not yet been sufficient to permit of computing the discharge.

Regulation.— Flow in canal is regulated by operators at Lockport and South Greece.

Ice.— There is usually no flow in the canal during the winter months.

Coöperation.— Station established by the United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of BARGE CANAL NEAR SOUTH GREECE, during the year ended June 30, 1919

Date	Made by	Gage Height		Discharge
		Gage No. 1	Gage No. 2	
1918		Feet	Feet	Sec.-ft.
July 31	E. D. Burchard	0.83	0.83	708
Aug. 20	C. C. Covert	1.80	1.88	579
Aug. 26	E. D. Burchard	1.70	1.77	591
Sept. 25	E. D. Burchard	1.07	1.075	610
Sept. 28	E. D. Burchard	1.08	1.13	564
Oct. 5	E. D. Burchard	1.36	1.43	456
Nov. 8	E. D. Burchard	1.81	1.94	327
Dec. 12	E. D. Burchard	2.78	2.79	538
1919				
June 8	O. W. Hartwell	1.92	1.995	191
June 20	J. W. Moulton	1.89	1.945	273

Daily gage height, in feet, of BARGE CANAL NEAR SOUTH GREECE, GAGE NO. 1, for the year ended June 30, 1919

Day	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	......	1.85	......	......	......	......	......	1.64
2	......	1.81	......	......	......	......	......	2.16
3	......	1.77	......	......	......	......	......	2.10
4	......	2.00	......	......	......	......	......	2.00
5	......	2.26	......	......	......	......	......	2.05
6	......	2.44	......	......	......	......	......	......
7	......	2.72	......	......	......	......	......	......
8	......	2.70	......	......	......	......	......	2.01
9	1.84	2.83	......	......	......	......	......	2.36
10	1.77	3.25	......	......	......	......	......	2.62
11	1.64	2.75	......	......	......	......	......	2.30
12	1.86	......	......	......	......	......	......	1.86
13	1.87	......	......	......	......	......	......	1.83
14	1.72	......	......	......	......	......	......	1.95
15	1.64	......	......	......	......	......	......	1.93
16	1.59	......	......	......	......	......	......	1.85
17	1.62	......	......	......	......	......	2.44	1.88
18	1.77	......	......	......	......	......	2.38	1.94
19	2.16	......	......	......	......	......	2.06	1.95
20	2.67	......	......	......	......	......	2.14	1.92
21	2.22	......	......	......	......	......	2.34	1.92
22	1.90	......	......	......	......	......	2.58	1.82
23	1.81	......	......	......	......	......	2.09	2.05
24	1.84	......	......	......	......	......	2.02	2.04
25	1.70	......	......	......	......	......	2.53	1.93
26	1.64	......	......	......	......	......	2.18	1.94
27	1.71	......	......	......	......	......	1.86	2.16
28	1.61	......	......	......	......	......	1.68	2.22
29	1.87	......	......	......	......	......	1.44	2.29
30	1.89	......	......	......	......	......	0.97	2.06
31	......	......	......	......	......	......	1.27	......

Daily gage height, in feet, of BARGE CANAL NEAR SOUTH GREECE, GAGE No. 2, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	......	0.73	1.80	0.84	2.87	1.88	......	......	......	......	......	1.72
2	......	0.89	1.79	0.75	2.19	1.83	......	......	......	......	......	2.25
3	......	1.07	1.82	1.00	2.20	1.70	......	......	......	......	......	2.19
4	......	1.31	1.82	1.42	2.24	2.00	......	......	......	......	......	2.07
5	......	1.37	1.84	1.37	2.11	2.25	......	......	......	......	......	2.12
6	......	1.47	1.88	1.68	2.41	2.48	......	......	......	......	......	2.24
7	......	1.65	1.87	1.64	2.06	......	......	......	......	......	......	2.18
8	......	1.82	1.90	1.86	1.79	2.69	......	......	......	......	......	2.07
9	......	1.77	1.94	1.78	1.85	2.83	......	......	......	......	......	2.43
10	......	1.64	1.98	1.63	1.80	3.12	......	......	......	......	......	2.72
11	......	1.58	1.90	1.54	1.70	2.67	......	......	......	......	......	2.40
12	......	1.64	1.87	1.51	1.92	......	......	......	......	......	......	1.94
13	......	1.74	1.93	1.58	1.88	......	......	......	......	......	......	1.90
14	......	1.89	2.06	1.53	1.76	......	......	......	......	......	......	2.03
15	......	1.94	2.05	1.60	1.68	......	......	......	......	......	......	2.00
16	......	1.89	2.14	1.69	1.61	......	......	......	......	......	2.29	1.93
17	......	1.85	2.21	1.64	1.62	......	......	......	......	......	2.54	1.97
18	......	1.82	2.36	1.59	1.81	......	......	......	......	......	2.49	2.01
19	......	1.83	2.80	1.55	......	......	......	......	......	......	2.15	2.02
20	......	1.80	2.32	1.58	......	......	......	......	......	......	2.20	1.96
21	......	1.77	2.29	1.61	2.25	......	......	......	......	......	2.41	1.99
22	......	1.76	2.61	1.60	1.94	......	......	......	......	......	2.67	1.92
23	......	1.73	1.80	1.66	1.85	......	......	......	......	......	2.19	2.12
24	......	1.68	1.22	1.70	1.81	......	......	......	......	......	2.09	2.06
25	......	1.66	1.03	1.67	1.69	......	......	......	......	......	2.62	1.93
26	......	1.65	0.96	1.68	1.67	......	......	......	......	......	2.25	1.97
27	......	1.56	0.88	1.62	1.74	......	......	......	......	......	1.96	2.25
28	......	1.51	1.03	1.69	1.58	......	......	......	......	......	1.77	2.33
29	......	1.58	1.13	1.83	1.83	......	......	......	......	......	1.52	2.47
30	......	1.54	0.97	1.84	1.87	......	......	......	......	......	1.05	2.28
31	0.63	1.63	......	2.06	......	......	......	......	......	......	1.35	......

BARGE CANAL AT LOCK No. 32

Location.— At lock No. 32, Barge canal, about 5 miles east of the city of Rochester.

Records available.— May 17, 1919, to June 30, 1919.

Gage.— Gurley 7-day graph water-stage recorder, located 25 feet upstream from concrete weir in diversion channel south of the lock-house. Recorder inspected by M. H. Quigley, lock-tender at lock No. 32.

Discharge measurements.— Made by wading about 50 feet below gage.

Control.— The control is the crest of the spillway.

Determination of discharge.— Daily discharge over spillway determined by applying mean daily gage heights to rating table. Daily discharge through lock is obtained by multiplying the lock capacity by the number of lockages per day. The following tables of discharge include the flow over the spillway and through the lock.

Accuracy.— Stage-discharge relation practically permanent. Results good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of BARGE CANAL AT LOCK No. 32, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
June 8	J. W. Moulton	1.05	30.0
June 10	J. W. Moulton	1.28	70.9
June 20	J. W. Moulton	1.248	62.1

Daily discharge, in second-feet, of BARGE CANAL AT LOCK No. 32, for the year ended June 30, 1919

Day	May	June	Day	May	June	Day	May	June
1		55	11		70	21	46	68
2		77	12		61	22	64	77
3		68	13		74	23	40	66
4		86	14		84	24	30	68
5		92	15		82	25	89	72
6		107	16		80	26	92	86
7		101	17	11	81	27	82	82
8		88	18	57	61	28	120	86
9		73	19	71	62	29	86	81
10		88	20	39	84	30	95	72
						31	59	
						Mean		77.7

Monthly discharge of BARGE CANAL AT LOCK No. 32, for the year ended June 30, 1919

Month	Discharge in Second-feet		
	Maximum	Minimum	Mean
June	107	55	77.7

BLACK CREEK, MONROE COUNTY

DESCRIPTION

Black creek rises in the extreme northern part of Wyoming county in the hilly region to the south of Batavia, flows in a general northerly direction to a point just north of the village of Byron, then turns to the east and enters the Genesee river at Genesee Junction. The slope of the creek is gradual for the greater part of its course, there being but one sharp descent, near the vil-

lage of Morganville, where it has a drop of about 140 feet in less than half a mile. The surrounding country is slightly rolling with some swamps and but few small ponds or lakes. The stream has numerous small tributaries, the principal one being Spring creek, which enters Black creek a short distance below the village of Byron.

BLACK CREEK NEAR GENESEE JUNCTION

Gage No. 228

This station, established May 14, 1917, is located on Black creek, about ½ mile above its junction with Genesee river. The gage, No. 228, is a standard Type A gage, having a range of 20 feet, between elevations 508.0 and 528.0 (B. C. datum). It is secured to the upstream end of the center pier of the old Genesee Valley canal aqueduct over Black creek. The gage was read once daily — in morning from July 1 to May 22 and in afternoon from May 22 to June 30 — to half-tenths.

Daily elevation of water-surface (B. C. datum) of BLACK CREEK AT OLD CANAL AQUEDUCT AT GENESEE JUNCTION, for the year ended June 30, 1919. J. Horton Begy, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	510.1	510.7	511.8	511.1	513.5	511.55	509.15	508.2	508.65	509.35	511.0	511.35
2	510.1	510.9	511.85	511.05	513.75	511.5	509.35	508.1	509.65	509.0	510.8	510.75
3	510.15	511.05	511.85	511.0	513.8	511.4	509.45	508.1	509.65	508.95	510.4	510.4
4	510.15	511.3	511.75	511.0	513.85	511.35	509.5	507.8	509.2	508.7	509.9	510.1
5	510.1	511.35	511.8	510.9	513.7	511.65	509.7	507.8	508.8	508.7	509.7	510.0
6	510.1	511.45	511.8	511.05	513.3	512.4	509.75	507.8	509.15	508.85	510.15	510.6
7	510.1	511.7	511.8	511.5	513.05	513.35	509.75	507.8	509.4	508.85	510.25	511.9
8	510.1	511.8	511.95	511.65	512.8	513.75	509.75	507.8	510.75	509.4	510.25	*a*
9	510.05	511.75	511.95	511.8	512.45	513.75	509.75	507.8	513.35	509.6	512.7	513.2
10	510.05	511.5	511.95	511.65	512.05	513.45	509.65	507.8	512.95	510.9	515.9	513.8
11	510.0	511.5	511.85	511.5	511.9	513.0	509.5	507.8	512.3	513.1	518.0	513.65
12	510.0	511.5	511.8	511.5	511.7	512.5	509.3	507.8	511.6	517.3	521.6	513.15
13	509.9	511.6	511.75	511.7	511.65	513.0	509.2	507.8	510.5	518.15	522.0	512.35
14	509.9	511.75	511.8	511.75	511.6	513.35	509.1	507.8	510.25	516.3	521.4	512.25
15	511.3	511.85	511.8	511.7	511.55	513.8	508.9	508.0	509.2	513.1	517.6	512.1
16	511.5	511.75	511.95	511.7	511.5	513.9	508.9	508.1	509.2	511.0	514.7	512.0
17	511.5	511.75	512.15	511.6	511.7	513.7	508.9	508.25	510.9	512.0	514.9	512.0
18	511.5	511.75	512.2	511.5	511.75	513.0	508.9	508.25	512.4	512.0	514.9	512.0
19	511.3	511.75	512.2	511.35	511.9	512.5	508.65	508.25	513.0	511.5	514.15	512.0
20	511.3	511.7	512.2	511.3	512.0	511.9	508.65	508.25	513.9	511.5	513.0	512.0
21	510.8	511.7	512.75	511.5	512.0	511.65	508.5	508.25	512.35	511.0	516.75	512.0
22	510.0	511.7	512.6	511.7	512.0	511.0	508.5	508.1	510.7	510.6	519.7	512.0
23	510.0	511.65	512.55	511.55	511.9	510.8	508.5	508.5	509.65	510.05	521.15	512.0
24	509.9	511.6	512.15	511.5	511.75	510.65	508.5	508.65	509.3	510.05	522.55	512.0
25	509.9	511.5	511.85	511.45	511.7	510.5	508.35	508.65	509.15	510.2	524.1	512.0
26	509.9	511.4	511.5	511.4	511.7	510.2	508.25	508.95	509.0	510.2	522.95	512.1
27	509.9	511.4	511.25	511.3	511.6	510.0	508.2	509.15	508.75	510.2	520.7	512.5
28	509.95	511.5	511.1	511.4	511.6	509.5	508.2	509.4	508.75	510.55	516.5	512.5
29	510.05	511.6	511.1	511.7	511.6	509.1	508.2	......	508.9	511.3	513.3	512.4
30	510.15	511.5	511.1	512.25	511.6	508.75	508.2	......	508.9	511.3	512.5	512.35
31	510.3	511.65	......	512.95	......	508.6	508.2	......	508.9	......	511.8	......

a No record.

CANADICE LAKE

DESCRIPTION

Canadice lake is tributary to Genesee river through Hemlock lake outlet and Honeoye creek. The area drained by the lake forms an irregular rectangle, the lake lying somewhat to the left of the longitudinal axis and the greater portion of the drainage being on the eastern slope. The western slope is narrow and precipitous. Bald hill rises from an altitude of 1,090 feet at the lake to 1,800 feet at the summit and has its axis parallel to the lake at an average distance of three-fourths of a mile from it. The lake has a water-surface area of 1.01 square miles and drains a total area of 12.6 square miles, 8 per cent of which is lake surface.

A weir was constructed at the outlet at the foot of the lake by the city engineer's department of Rochester, N. Y., in February, 1903. The entire yield of the drainage basin passes this weir.

CANADICE LAKE OUTLET NEAR HEMLOCK

Location.— In outlet, at foot of lake, which discharges to Genesee river through Hemlock lake outlet and Honeoye creek.

Drainage area.— 12.6 square miles, of which 1.01 square miles are lake surface.

Records available.—April, 1903, to date. Data also in water-supply paper, Surface Water-Supply of the United States, Part IV; St. Lawrence River Basin, published by the United States Geological Survey; also in reports of the city engineer of Rochester.

Gage.— Hook gage, in channel above weir.

Computation of discharge.—In November, 1915, the former timber and plank channel with an overfall weir about fifteen feet long, which could be shortened to five feet, was replaced by a concrete construction with an overfall weir at the same elevation with a crest ten feet long with end contraction suppressed, said

weir also being capable of being reduced by vertical needles to a five-foot weir with complete end contractions.

Diversions.— No water is diverted from Canadice lake above the station.

Regulation.— Outflow of lake at dam above weir is controlled by bulkhead and gates.

Ice.— Pool above weir is free from ice throughout winter.

Accuracy.— Observations and computations made with care; the result should be very good.

Coöperation.— Data collected and furnished for publication by office of city engineer, Rochester.

Mean monthly water-surface and monthly discharge of CANADICE LAKE NEAR HEMLOCK, for the year ended June 30, 1919

[Drainage area, 12.6 square miles.]

Month	Mean elevation of lake above low-water mark	Discharge in second-feet		Run-off
		Mean	Per square mile	Depth in inches on drainage area
July	1.779	3.530	0.280	0.32
August	1.376	2.779	0.221	0.25
September	0.992	2.168	0.172	0.19
October	0.869	1.816	0.144	0.17
November	0.993	2.170	0.172	0.19
December	1.278	2.427	0.193	0.22
January	1.656	5.387	0.428	0.49
February	1.158	15.671	1.244	1.30
March	0.778	16.927	1.343	1.55
April	1.674	16.156	1.282	1.43
May	3.239	48.847	3.877	4.47
June	2.953	8.578	0.681	0.76
The year	1.562	10.538	0.836	11.34

NOTE.— As the outlet of the lake is controlled by gates, it is fair to state that the terminal water-surface for the year ended June 30, 1919, was 0.94 foot higher than the year before, corresponding to a gain in storage of 28,068,266 cu. ft., or a discharge of 0.890 cubic foot per second. This correction applied to the mean for the year gives 11.428 cubic feet per second, equivalent to 0.907 second-foot per square mile of drainage area, or a depth of run-off of 12.312 inches on the drainage area.

OSWEGO-ONEIDA-SENECA RIVER DRAINAGE BASIN

DESCRIPTION OF BASIN

Oswego river is formed by the union of Seneca and Oneida rivers at Three River Point about twelve miles northwest of Syracuse, whence its course is northwestward to Oswego, where it enters Lake Ontario. The length of the river, from the junction to the mouth, is about 20.5 miles and the drainage basin along this distance is a narrow strip of country, moderately rolling. Above the junction of Seneca and Oneida rivers the basin spreads out, attaining an extreme width east and west of about 100 miles and north and south of from 70 to 80 miles. There is, on the whole, a gradual rise from the low, level lands which border Lake Ontario to the north-south ridges which separate the various lakes south of Seneca river and which farther south become merged with the still more elevated country lying along the southern boundary of the Lake Ontario watershed.

The most remarkable feature of the drainage basin is the chain of lakes stretching across its southern border. From west to east the principal lakes are, in order, Canandaigua, Keuka, Seneca, Cayuga, Owasco, Skaneateles and Oneida. These seven lakes include a water-surface of approximately 270 square miles, increased by four smaller lakes — Cross, Onondaga, Otisco and Cazenovia — to about 283 square miles. The larger of the lakes, Oneida, Cayuga and Seneca, are used for steam-towing navigation, having connection with the Erie and Oswego canals, and together with Onondaga form a part of the New Barge canal system. Cayuga and Seneca lakes are noted for their depth and for the abrupt slopes of their beds. The influence of the lakes on Oswego river is of the utmost importance in contributing to the steadiness of its flow.

Drainage areas tributary to ONEIDA LAKE AND ONEIDA RIVER *

LOCALITY	AREA IN SQUARE MILES		
	Place to place	Sub-total	Total
East branch, Fish creek.			
Head to junction with Alder creek	45.40	45.40	
Alder creek	25.70	71.10	
Junction with Alder creek to junction with Point Rock creek	36.70	107.80	
Point Rock creek	19.90	127.70	
Junction with Point Rock creek to junction with Fall brook	4.50	132.20	
Fall brook	13.50	145.70	
Junction with Fall brook to junction with Florence creek	1.30	147.00	
Florence creek	20.40	167.40	
Junction with Florence creek to junction with Furnace creek (Taberg)	1.70	169.10	
Furnace creek	14.40	183.50	
Taberg to junction with West branch, Fish creek	3.60	187.10	
West branch, Fish creek.			
Head to lower dam, Williamstown	25.80	25.80	
Williamstown to West Camden	27.10	52.90	
West Camden to junction with Mad river, Camden	14.20	67.10	
Mad river	45.40	112.50	
Camden to junction with Little river	21.60	134.10	
Little river	52.10	186.20	
Little river to McConnellsville	4.00	190.20	
McConnellsville to junction with East branch, Fish creek	11.90	202.10	
Total, East and West branches, Fish creek	....	389.20	
Junction of East and West branches, Fish creek, to junction with Wood creek	27.80	417.00	417.00
Wood creek (Oneida county).			
Above Erie canal, Rome	10.20	10.20	
Erie canal, Rome, to junction with Mud creek	2.00	12.20	
Mud creek (Oneida county)	20.00	32.20	
Junction with Mud creek to junction with Canada creek	6.40	38.60	
Canada creek	31.00	69.60	
Junction with Canada creek to junction with Stony creek	1.20	70.80	
Stony creek	20.40	91.20	
Junction with Stony creek to junction with Fish creek	31.40	122.60	122.60
Oneida creek			
Head to Peterboro	13.40	13.40	
Peterboro to Falls	6.70	20.10	
Falls to Munnsville	15.60	35.70	
Munnsville to Kenwood	27.30	63.00	
Kenwood to Oneida Castle (State dam)	10.80	73.80	
Oneida Castle to Sconondoa creek, Oneida	2.10	75.90	
Sconondoa creek	34.30	110.20	
Sconondoa creek to Durhamville	4 80	115.00	
Durhamville to mouth	28.00	143.00	143.00
Canaseraga creek (Madison county).			
Head to Perryville	5.70	5.70	
Perryville to Erie canal	9.00	14.70	
Erie canal to Douglas ditch	8.10	22.80	
Cowaselon creek.			
Head to Clockville creek	17.20	17.20	
Clockville creek	11.10	28.30	
Clockville creek to Erie canal	5.50	33.80	
Erie canal to mouth of Douglas ditch	39.30	73.10	
Total, all above junction with Douglas ditch	....	95.90	
Junction with Douglas ditch to Lakeport	3.20	99.10	99.10
Chittenango creek.			
Erieville reservoir, water-surface	0.45	0.45	
Erieville reservoir, land drainage	3.30	3.75	
Erieville reservoir to Cazenovia lake	30.50	34.25	
Cazenovia lake, water-surface	1.70	35.95	
Cazenovia lake, land drainage	8.70	44.65	
Cazenovia lake to Chittenango falls	14.40	59.05	
Chittenango falls to State dam, Chittenango	17.90	76.95	
State dam to junction with Butternut creek	28.10	105.05	
Butternut creek.			
Head to Jamesville reservoir	47.40	47.40	
Jamesville reservoir to State dam	5.70	53.10	
State dam to junction with Limestone creek	19.20	72.30	

* From U. S. Geological Survey topographic maps.

Drainage areas tributary to ONEIDA LAKE AND ONEIDA RIVER *— *Continued*

LOCALITY	Area in Square Miles		
	Place to place	Sub-total	Total
Chittenango creek — *Continued.*			
Butternut creek — *Continued.*			
Limestone creek.			
De Ruyter reservoir, water-surface	1.00	1.00	
De Ruyter reservoir, land drainage	17.80	18.80	
De Ruyter reservoir, to junction with East branch	4.30	23.10	
East, or New Woodstock branch	12.60	35.70	
Junction with East branch to junction with West branch	34.50	70.20	
West branch, Limestone creek, enters above State feeder dam	24.80	95.00	
State dam to junction with Butternut creek	18.20	113.20	
Total, Butternut and Limestone creeks, above junction	....	185.50	
Junction with Limestone creek to Chittenango creek	1.10	186.60	
Total, Chittenango and Butternut creeks, above junction	....	291.65	
Junction with Butternut creek to Bridgeport	30.30	321.95	
Bridgeport to Oneida lake	4.30	326.25	326.25
Oneida lake drainage through main streams	....	1,107.95	
Big Bay creek	26.30		
Little Bay creek	11.50		
Scriba creek	45.40		
Coast drainage, north shore Oneida lake	54.50		
Coast drainage, south shore Oneida lake	28.90	166.60	1,274.55
Water-surface, Oneida lake	78.00		
Land drainage, Oneida lake	1,274.55	1,352.55	
Oneida river.			
Brewerton to Caughdenoy creek	4.80	4.80	1,357.35
Caughdenoy creek	19.30	24.10	1,376.65
Caughdenoy creek to Oak Orchard	25.10	49.20	1,401.75
Mud creek (Onondaga county)	34.70	83.90	1,436.45
Oak Orchard to Potts creek	5.00	88.90	1,441.45
Potts creek	22.90	111.80	1,464.35
Six-Mile creek (Oswego county)	24.00	135.80	1,488.35
Potts creek to Three River Point	4.50	140.30	1,492.85

Drainage areas tributary to SENECA RIVER *

LOCALITY	Area in Square Miles			
	Place to place	Sub-total	Branch total	General total
Mud creek (Ontario county).				
Head to and including Schaffer creek	51.31			
Junction with Schaffer creek to junction with Sucker brook, Victor (formerly Ganargua creek)	25.70	77.01		
Sucker brook	20.15	97.16		
Ganargua creek.				
Victor to Erie canal, Macedon	26.20	123.36		
Macedon to junction with East Red creek, East Palmyra	55.00	178.36		
East Red creek	59.50	237.86		
East Red creek to Canandaigua outlet	61.37	299.23	299.23	
Canandaigua lake.				
Naples creek	48.55			
West river	42.08	171.97		
Other land drainage	81.34			
Water-surface	16.40	....	188.37	

* From U. S. Geological Survey topographic maps.

Drainage areas tributary to SENECA RIVER — *Continued*

LOCALITY	AREA IN SQUARE MILES			
	Place to place	Sub-total	Branch total	General total
Canandaigua outlet.				
Foot of the lake to and including Black brook	50.37	238.74		
Black brook to Flint creek, at Phelps	54.34	293.08	293.08	
Flint creek.				
Above Patten	31.59			
Patten to Gorham, not including Gorham swamp	24.84	56.43		
Gorham swamp	5.46	61.89		
Gorham to Orleans	25.57	87.46		
Orleans to junction with Canandaigua outlet at Phelps	15.21	102.67	395.75	
Phelps to junction with Ganargua creek at Lyons, forming Clyde river	48.36	444.11	743.34	
Clyde river.				
Lyons to junction with Seneca river, foot of Cayuga lake	141.11	884.45	....	884.45
Seneca river.				
Seneca lake.				
Keuka lake.				
Land drainage to outlet	160.96			
Water-surface	17.51	178.47		
Keuka outlet to Seneca lake	24.80	203.27		
Catharine creek.				
Above Montour Falls	66.46	....	640.93	
Montour Falls to Seneca lake	29.91	96.37		
Glen creek	23.53	23.53		
Direct lake drainage	317.76	317.76		
Water-surface	67.16	....	708.09	
Seneca river, foot of Seneca lake to Waterloo	40.90	....	748.99	
Seneca river, Waterloo to Seneca Falls	28.55	....	777.54	
Seneca river, Seneca Falls to Mud lock, foot of Cayuga lake	7.52	....	785.06	
Cayuga lake.				
Cascadilla creek	14.38			
Six-Mile creek	59.05			
Buttermilk creek	29.16			
Cayuga inlet	67.02			
Salmon creek	91.13			
Fall creek.				
Above Freeville	58.68			
Virgil creek	26.00	84.68		
Freeville to Cornell dam	30.62	115.30		
Cornell dam to Cayuga lake	1.56	116.86		
Taghanic creek.				
Above Halseyville	56.96			
Halseyville to Taghanic falls	10.40	67.36		
Taghanic falls to Cayuga lake	0.39	67.75		
Other Cayuga lake drainage	275.04	720.39		
Cayuga lake, water-surface	66.31	786.70	1,571.76	
Seneca river, Cayuga lake to junction with Clyde river	15.42	....	1,587.18	2,471.63
Seneca river, junction with Clyde river to junction with Owasco outlet	146.23	....	....	2,617.86
Owasco lake.				
Owasco inlet, above Moravia	74.33			
Moravia to Owasco lake	42.92	117.25		
Direct drainage to lake	76.24	193.49		
Foot of lake to State dam	0.98	194.47		
Water-surface	10.40	204.87		
Owasco outlet to junction with Seneca river	16.73	221.60	....	2,839.46
Seneca river, junction with Owasco outlet to junction with Skaneateles outlet	98.70	....	....	2,938.46
Skaneateles lake.				
Land drainage to foot	58.41			
Water-surface	14.13	72.54		
Foot of lake to Willow Glen	1.84	74.38		
Willow Glen to Seneca river	16.69	91.07	....	3,029.23
Seneca river, Skaneateles outlet to Carpenter brook	25.50	....	....	3,054.73

Drainage areas tributary to SENECA RIVER — *Concluded*

LOCALITY	AREA IN SQUARE MILES			
	Place to place	Sub-total	Branch total	General total
Seneca River — *Continued.*				
Carpenter brook	18.70	....	....	3,073.43
Seneca river, Carpenter brook to Baldwinsville	48.10	....	....	3,139.33
Seneca river, Baldwinsville to Onondaga outlet	17.80	....	....	3,121.50
Onondaga lake.				
Otisco lake, land drainage to foot	41.40			
Otisco lake, water-surface	3.30	44.70		
Nine-Mile creek, Onondaga county (Otisco outlet), to Onondaga lake	74.00	118.70		
Onondaga creek.				
Above junction with West brook	40.60			
Junction with West brook to inflow to Onondaga lake	65.30	105.90		
Other land drainage to Onondaga lake	50.10	283.70		
Onondaga lake, water surface	4.70	288.40		
Onondaga outlet, lake to Seneca river	3.00	291.40	....	3,430.73
Seneca river, Onondaga outlet to Belgium	10.12	....	....	3,440.85
Seneca river, Belgium to Three River Point	4.40	....	....	3,445.24

Drainage areas tributary to OSWEGO RIVER *

LOCALITY	AREA IN SQUARE MILES		
	Place to place	Total from Three River Point	Total drainage basin
Oneida river, above Three River Point	....	....	1,492.85
Seneca river, above Three River Point	....	....	3.445.24
Oswego river, at Three River Point	....	....	4,938.09
Three River Point to Phoenix	2.32	2.32	4,940.41
Phoenix to Hinmansville	17.58	19.90	4,957.99
Hinmansville to Ox creek	17.05	36.95	4,975.04
Ox creek	33.68	70.63	5.008.72
Ox creek to upper dam, Fulton	9.15	79.78	5,017.87
Fulton to Neatahwanta creek	9.15	88.93	5,027.02
Neatahwanta creek	21.92	110.85	5,048.94
Neatahwanta creek to Black creek	1.01	111.86	5.049.95
Black creek	37.93	149.79	5.087.88
Black creek to Battle Island	0.92	150.71	5,088.80
Battle Island to Minetto	2.11	152.82	5.090.91
Minetto to High dam	4.87	157.69	5,095.78
High dam to Oswego dam	1.22	158.91	5.097.00
Oswego dam to Lake Ontario	1.21	160.12	5.098.21

* From U. S. Geological Survey topographic maps.

OSWEGO RIVER

DESCRIPTION

The drainage area tributary to Oswego river, exclusive of Seneca and Oneida rivers, is 160 square miles. This area comprises chiefly moderately-rolling, cultivated upland, having a good depth of soil overlying the rock, which, as a rule, is visible only in the bed of the stream. A portion of the area is drained through lakes and marshes. The run-off from the direct drainage to Oswego river is moderate and the regimen differs but little from that resulting from the inflow of the two main tributaries — the Oneida and Seneca.

The river is canalized for practically its entire length by the Barge canal improvement and almost all of the 118.6 feet drop between canal pool at Three River Point and low water in Lake Ontario occurs at six dams, all having bulkhead gates for power purposes, the upper two of which have large Taintor gates for surface regulation. The Battle Island dam and old High dam have been drowned out by new structures — dam No. 5 at Minetto and dam No. 6 (new High dam) above Oswego, respectively.

In the following series of tables there are given records of the daily elevation of water-surface of the Oswego river at different gaging stations for the year ended June 30, 1918. Owing to the completion of the canal construction the locations at which certain water-surface elevations were taken have been shifted, in general being located on the finished structures. Locations of old and new gages and reasons for change are briefly noted.

The tables of elevations of water-surface are arranged in order, proceeding downstream from Three River Point to Lake Ontario. The water-surface is in general read to the nearest tenth of a foot, usually either on a staff gage or by measuring down from a reference point.

OSWEGO RIVER ABOVE DAM AT PHOENIX

Gage No. 180

Records published previous to 1914 as "above dam at Phoenix" are of "East line gage," located on the east side of the river, March 1, 1912, to May 5, 1913, between 200 and 250 feet above east bulkhead, and May 6, 1913, to December 31, 1914, at the shore end of east bulkhead. This gage was discontinued and the

record is taken at the upper end of the guide-wall to Barge canal lock No. 1. Gagings which may be considered the beginning of this new record have been taken from May 18, 1912, to December 31, 1914, at the upper end of lock No. 1.

On July 27, 1916, a standard Type B gage, No. 180, was erected near the angle in the east upper guide-wall above Lock street bridge, and has a range of 12 feet, between elevations 358.0 and 370.0. A standard bench-mark plug was set in the face of the wall near the gage, at elevation 368.0 (B. C. datum).

Barge canal construction has replaced the old crest at about elevation 359.1 with two sections of fixed crest at elevation 363.0, running diagonally upstream to six Taintor gates, each twenty-eight feet six inches clear span, immediately below the Lock street bridge.

The gage is read twice daily — morning and afternoon — to tenths, with occasional readings to half-tenths.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER ABOVE DAM AT PHOENIX, for the year ended June 30, 1919. C. E. Greenfield, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	363.75	363.80	363.35	363.85	363.90	363.75	363.70	363.80	363.95	364.20	364.50	364.05
2.....	363.45	363.70	363.60	363.88	363.80	364.00	364.00	363.80	364.15	364.15	364.60	364.00
3.....	363.60	363.60	363.52	363.78	364.00	363.85	363.95	363.85	364.05	364.20	364.35	363.75
4.....	363.75	363.75	363.50	363.80	364.00	363.75	364.00	363.90	364.20	364.30	364.15	363.80
5.....	363.70	363.80	363.42	363.90	363.85	363.72	363.85	363.90	364.00	364.45	364.20	363.80
6.....	363.65	363.80	363.42	363.95	363.80	363.75	363.90	364.00	364.20	364.20	364.30	363.70
7.....	363.65	363.75	363.40	363.95	363.85	363.82	363.72	364.18	364.10	364.20	364.30	363.85
8.....	363.55	363.70	363.45	364.00	363.78	363.80	363.75	364.15	364.10	364.25	364.15	363.95
9.....	363.65	363.75	363.60	363.90	363.75	363.90	363.75	364.00	364.30	364.40	364.20	364.00
10.....	363.65	363.75	363.45	363.85	363.70	363.90	363.70	363.90	364.60	364.40	364.40	363.95
11.....	363.85	363.85	363.45	363.85	363.72	363.85	363.80	363.88	364.62	364.55	364.30	364.10
12.....	363.80	363.88	363.50	364.00	363.85	363.78	364.10	363.85	364.50	364.90	364.40	363.95
13.....	363.80	363.80	363.60	363.98	363.68	363.90	364.20	363.80	364.30	364.90	364.40	363.80
14.....	363.80	363.68	363.60	363.85	363.75	364.12	364.15	364.05	364.40	364.70	364.35	363.80
15.....	363.70	363.62	363.75	363.80	363.95	364.00	364.05	364.00	364.35	364.55	364.15	363.85
16.....	363.75	363.55	363.80	363.80	364.00	363.90	363.98	363.88	364.35	364.45	364.15	363.80
17.....	363.72	363.55	363.80	363.80	363.98	363.90	363.95	363.90	364.45	364.15	364.10	363.90
18.....	363.70	363.60	363.80	363.80	364.00	363.90	363.90	363.85	364.55	364.10	364.05	363.95
19.....	363.70	363.68	363.80	363.80	363.90	363.80	364.00	363.70	364.70	364.05	364.05	363.75
20.....	363.65	363.58	364.00	363.95	363.85	363.78	363.98	363.70	364.70	364.10	364.20	363.80
21.....	363.85	363.60	364.00	363.85	363.75	363.80	363.90	363.68	364.65	364.40	364.00	363.75
22.....	363.85	363.50	364.10	363.80	363.75	363.80	363.90	363.60	364.40	364.55	364.05	363.70
23.....	363.80	363.50	364.05	363.80	363.80	363.80	363.95	363.75	364.35	364.50	364.30	363.88
24.....	363.85	363.35	363.98	363.80	363.75	364.00	364.10	363.95	364.35	364.45	364.20	363.90
25.....	363.90	363.35	363.92	363.80	363.70	364.00	364.00	364.00	364.40	364.40	364.30	363.85
26.....	363.90	363.50	363.98	363.90	363.80	363.90	364.05	364.00	364.40	364.50	364.35	363.70
27.....	363.85	363.50	364.02	363.95	363.82	363.80	363.95	364.00	364.30	364.40	364.35	363.65
28.....	363.95	363.45	364.10	363.85	363.85	363.75	364.00	363.90	364.10	364.35	364.25	363.75
29.....	364.00	363.45	364.00	363.88	363.78	363.75	363.92	......	364.25	364.45	364.05	363.90
30.....	363.90	363.30	363.95	363.80	363.65	363.75	363.90	......	364.35	364.50	364.00	363.80
31.....	363.82	363.28	......	363.95	......	363.70	363.80	......	364.20	......	363.90	......

OSWEGO RIVER BELOW DAM AT PHOENIX

Gage No. 179

The record of water-surface, "1,600 feet below dam at Phoenix," is that of the "North line gage" and has been taken as follows: November 1, 1910, to February 9, 1914, at junction of canal and river about 1,600 feet below the dam; February 10, 1914, to May 14, 1914, in river at temporary bridge about 800 feet below dam; May 15, 1914, and thereafter, in canal at lower end of Barge canal lock No. 1, at which location the surface is practically the same as at the junction of the canal and river.

On July 28, 1916, a standard Type B gage, No. 179, was erected on the end of the lower north approach wall to lock No. 1, and has a range of 16 feet, between elevations 352.0 and 368.0. The gage bench-mark, a copper plug set in stone at northwest corner of lock No. 1, is at elevation 368.55 (B. C. datum).

The gage is read twice daily — morning and afternoon — to tenths, with occasional readings to half-tenths.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER, 1,600 FEET BELOW DAM AT PHOENIX, for the year ended June 30, 1919. C. E. Greenfield, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	354.25	353.10	352.35	354.30	355.55	354.40	354.30	355.05	354.15	355.90	356.55	356.70
2.....	354.15	353.00	352.75	354.75	355.20	354.45	354.55	355.65	355.00	356.00	356.65	356.55
3.....	353.25	353.00	352.85	353.70	355.30	354.40	355.25	355.15	355.05	355.85	356.85	356.10
4.....	353.75	352.60	352.90	354.40	355.35	354.05	355.45	354.55	354.35	356.15	356.40	355.20
5.....	354.35	353.25	352.95	353.95	355.20	353.85	355.15	354.60	354.40	356.80	356.40	355.10
6.....	354.40	352.95	353.05	354.15	355.10	353.90	355.65	354.50	354.45	356.90	356.55	354.80
7.....	354.20	352.90	353.05	354.30	354.65	354.25	355.20	354.00	354.45	356.82	356.30	355.05
8.....	353.90	352.95	352.85	354.20	354.45	354.40	354.95	353.95	354.22	356.30	356.40	355.15
9.....	353.00	353.05	353.05	354.70	354.45	354.25	354.90	354.55	355.25	356.05	355.90	355.35
10.....	353.15	353.05	353.05	354.45	354.50	354.55	355.45	354.60	356.10	356.55	356.20	355.30
11.....	353.50	353.00	353.05	354.25	354.30	354.80	355.20	353.65	356.35	356.20	357.10	355.30
12.....	354.10	353.38	353.05	354.50	354.25	354.45	355.10	353.40	356.45	357.40	356.95	355.50
13.....	354.65	353.00	353.20	354.45	354.50	354.00	355.25	353.05	356.25	358.05	357.35	354.95
14.....	354.85	352.90	353.25	354.35	354.00	354.95	354.70	353.65	355.80	358.20	357.25	354.50
15.....	354.60	352.98	353.30	354.20	353.65	355.45	354.80	354.05	355.75	357.75	356.90	355.20
16.....	353.30	352.90	353.50	354.05	354.55	355.55	354.75	354.85	355.65	357.35	356.35	354.50
17.....	353.30	353.00	353.40	353.95	354.75	356.00	354.70	354.70	356.15	356.90	356.30	354.90
18.....	353.30	352.80	353.25	354.35	355.25	355.80	354.75	354.15	356.35	356.60	356.35	354.60
19.....	353.15	352.90	353.45	354.45	354.90	355.55	354.70	353.85	356.65	356.45	356.40	354.75
20.....	353.35	353.00	353.90	354.45	354.90	355.25	355.15	353.60	356.80	356.50	356.20	353.65
21.....	353.82	352.75	354.55	354.30	354.80	355.25	354.80	353.65	356.75	356.40	356.50	353.60
22.....	354.00	353.00	354.75	354.30	355.00	355.50	354.55	353.70	356.70	356.35	356.35	354.20
23.....	353.38	352.90	353.70	354.15	354.60	354.20	354.90	354.00	356.85	356.15	357.40	354.25
24.....	353.10	353.00	354.15	354.30	354.65	355.45	355.85	354.55	356.40	356.05	357.85	353.35
25.....	353.10	352.85	354.80	354.20	354.30	355.85	355.85	353.35	356.10	355.55	358.05	353.40
26.....	353.05	352.80	354.70	355.05	354.25	355.60	355.75	353.60	356.00	356.10	357.95	353.40
27.....	353.20	353.10	354.45	355.20	354.15	355.25	355.70	353.92	356.30	356.30	357.50	353.30
28.....	353.45	353.15	354.65	355.25	354.65	355.10	355.55	353.75	355.75	355.85	357.25	353.30
29.....	353.45	352.95	354.65	354.45	354.30	355.25	355.35	......	355.30	356.90	356.85	354.25
30.....	353.15	352.92	354.25	354.75	354.20	355.20	355.30	......	356.15	356.45	356.80	354.10
31.....	353.05	352.90	......	355.30	......	354.85	355.10	......	356.30	......	356.50	......

OSWEGO RIVER AT HINMANSVILLE

Gage No. 178

The Hinmansville highway bridge across the Oswego river is about three miles north of Phoenix. This station was established April 13, 1904, and discontinued February 25, 1914, owing to the removal of the old highway bridge. During this period a chain gage located on the downstream side of the bridge pier was read. The station was reëstablished January 1, 1915. A direct-reading staff gage, located on the south abutment of a highway bridge over the mouth of the creek entering the river from the west immediately above the abutment of the Hinmansville bridge, was replaced on August 8, 1916, by a standard Type A gage, No. 178, erected in the same location and having a range of 11½ feet, between elevations 351.5 and 363.0. The gage bench-mark, consisting of a square cut in the southwest corner of the south abutment of the highway bridge over the creek, is at elevation 362.899 (B. C. datum).

The gage is read once daily — A. M.— to half-tenths.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER AT HINMANSVILLE BRIDGE, NEAR PHOENIX, for the year ended June 30, 1919. Leon Hallenbeck and Arthur Grey, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
1	354.0	352.9	353.2	353.9	355.0	354.2	354.3	354.7	353.1	355.6	356.1
2	353.7	353.0	353.0	353.7	354.9	354.4	355.6	355.5	353.3	355.5	355.8
3	353.0	353.9	352.9	353.4	355.8	354.3	354.3	354.8	354.4	355.2	355.8
4	354.45	353.5	352.8	353.7	354.5	353.7	355.0	354.7	354.0	355.5	355.7
5	354.5	353.0	353.1	353.9	354.8	353.9	355.7	354.5	354.0	356.0	355.3
6	354.0	352.8	353.0	353.9	354.6	353.8	355.1	354.2	354.3	356.3	355.8
7	353.9	352.7	352.9	354.1	354.5	353.9	354.7	354.3	353.8	356.5	355.7
8	353.8	352.9	353.2	354.3	354.0	354.4	354.5	354.7	353.3	356.0	355.6
9	352.8	353.0	353.0	354.5	354.3	354.25	354.6	354.4	354.2	355.2	354.8
10	353.0	352.9	352.9	354.0	354.5	354.4	354.9	354.1	354.0	356.2	355.3
11	353.3	353.3	352.7	354.1	354.0	354.8	355.1	354.5	355.3	355.2	356.5
12	354.0	352.8	352.9	354.2	353.5	354.6	354.8	354.6	355.7	356.6	356.8
13	354.3	352.6	353.1	354.2	353.7	353.8	354.7	352.6	355.8	356.7	356.6
14	354.5	352.7	353.2	354.0	354.0	354.8	353.7	352.6	355.9	357.0	356.4
15	354.3	352.9	353.5	353.7	354.2	355.6	354.3	354.6	354.5	356.6	356.2
16	353.0	352.7	353.1	353.5	354.2	354.8	354.4	353.1	356.0	356.2	355.4
17	353.0	352.8	353.4	353.0	354.3	355.8	354.5	354.5	355.7	355.9	355.5
18	353.0	353.0	352.3	353.3	355.0	355.5	354.6	353.1	355.8	355.4	355.9
19	352.8	352.7	353.4	353.9	354.7	355.2	355.1	354.3	356.2	355.3	355.6
20	353.0	352.6	353.7	354.2	354.9	355.1	354.9	354.4	356.4	355.6	355.4
21	353.9	352.9	354.3	354.0	354.9	355.1	354.6	354.6	356.3	355.1	355.5
22	353.0	352.7	354.7	353.9	354.9	355.1	354.5	354.4	356.2	355.6	355.3
23	353.2	352.8	354.2	353.9	354.7	355.7	354.8	354.6	356.4	355.4	356.5
24	353.0	353.0	353.7	354.3	354.3	355.1	354.6	353.5	356.4	355.6	356.7
25	352.8	353.1	354.3	354.5	353.75	355.5	355.6	353.0	355.8	354.9	356.8
26	352.8	353.0	354.5	354.8	353.9	355.4	355.7	353.7	355.5	355.4	357.0
27	352.7	353.2	354.3	354.8	354.2	354.7	355.7	354.1	355.8	356.1	356.3
28	353.0	353.0	354.3	354.6	354.3	354.1	355.2	353.2	355.6	355.4	356.0
29	352.8	352.8	354.4	353.9	354.3	355.0	355.3	.....	354.9	356.3	355.3
30	352.9	353.0	354.1	354.3	353.9	355.3	355.3	.....	354.8	356.2	355.7
31	352.9	353.1	.....	354.7	.....	354.7	355.1	.....	355.9	.....	355.9

NOTE.— Station discontinued May 31, 1919.

OSWEGO RIVER AT OX CREEK, NEAR FULTON

Gage No. 177

Ox creek enters the Oswego river from the west, four miles upstream from the upper dam at Fulton. On April 12, 1904, a gaging station was established near its junction with Oswego river. A direct-reading staff gage, located on the downstream end of the north abutment of the Fulton-Phoenix highway bridge over Ox creek, was replaced on August 7, 1916, by a standard Type A gage, No. 177, in the same location. A standard bench-mark plug was set in the face of the abutment near the gage at elevation 358.0 (B. C. datum). This gage is about 700 feet upstream from the mouth of the creek and during floods in the creek there may be some slight drop between the gage and the river.

The gage is read once daily — at about 11 A. M. — to half-tenths and even hundredths.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER AT MOUTH OF OX CREEK, NEAR FULTON, for the year ended June 30, 1919. B. M. Wilcox, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	353.80	352.60	352.20	353.86	354.58	353.90	354.00	354.60	353.85	354.95	354.92	354.70
2	353.10	352.55	352.82	354.22	354.52	353.85	354.85	355.24	354.15	354.90	355.20	354.60
3	352.72	352.62	352.50	352.90	354.50	353.70	354.90	355.00	354.70	354.88	354.92	354.50
4	353.65	352.38	352.65	353.85	353.70	353.35	354.95	354.18	353.84	354.95	354.80	354.18
5	353.80	352.60	352.55	353.00	354.30	353.32	355.30	354.22	353.80	355.40	354.50	354.00
6	354.00	352.64	352.65	353.60	354.02	353.30	354.78	354.20	353.82	355.85	355.26	354.00
7	353.80	352.65	352.65	353.35	353.90	353.65	354.40	353.78	353.90	355 70	355.28	354.45
8	353.64	352.60	352.65	353.40	353.68	353.64	354.18	353.42	353.50	355.45	355.00	353.80
9	352.75	352.70	352.70	354.05	353.60	353.40	354.15	353.85	354.12	354.52	354.02	353.95
10	352.74	352.72	352.52	353.50	353.00	353.90	354.20	354.65	355.48	355.55	354.56	354.82
11	352.80	352.68	352.55	353.30	353.00	353.86	354.25	353.25	355.45	354.10	355.35	353.80
12	353.58	352.75	352.70	354.00	353.90	353.80	354.65	352.98	355.52	355.75	355.25	354.46
13	353.15	352.80	352.70	353.8[illegible]	353.85	353.28	354.18	352.98	355.40	355.84	355.50	354.00
14	354.10	352.70	352.80	353.60	353.52	354.25	353.90	353.10	355.18	356.00	354.92	353.80
15	353.40	352.60	353.10	353.60	353.52	354.78	353.90	353.60	355.00	355.44	354.80	354.00
16	352.75	352.42	352.74	353.35	354.22	354.82	353.90	354.00	355.20	355.00	354.30	353.12
17	352.75	352.65	352.90	353.00	353.95	355.22	353.90	354.45	355.54	354.78	354.30	354.50
18	352.72	352.70	352.90	353.75	354.20	355.00	354.10	353.60	355.42	354.44	354.85	353.52
19	352.72	352.55	353.20	353.80	353.95	354.80	354.70	353.45	355.65	354.42	354.75	354.34
20	352.95	352.66	353.25	354.00	353.82	354.72	354.55	353.10	355.84	354.68	354.48	353.20
21	353.62	352.40	354.15	353.60	353.85	354.58	354.32	352.90	355.65	354.00	354.85	352.90
22	353.40	352.62	354.20	353.68	354.38	355.00	354.00	352.78	355.70	354.95	354.25	353.50
23	352.68	352.55	354.00	353.55	354.25	353.25	354.42	353.15	355.80	354.92	355.52	353.55
24	352.65	352.55	353.20	353.30	354.25	354.80	355.12	353.80	355.62	354.98	355.45	352.80
25	352.55	352.65	354.20	353.30	353.00	355.28	355.30	352.90	355.30	354.00	355.50	352.80
26	352.54	352.45	354.00	354.35	353.62	355.50	355.45	352.90	355.30	354.50	355.72	352.96
27	352.65	352.60	354.00	354.50	353.48	354.10	355.02	353.20	355.28	354.52	354.95	352.84
28	353.45	352.80	354.1	354.40	354.05	354.05	354.95	353.10	354.62	354.72	354.84	352.72
29	352.00	352.65	354.15	353.55	353.58	354.50	354.82	......	354.35	355.75	354.45	353.20
30	352.75	352.60	353.46	353.72	353.60	354.75	354.80	......	355.10	355.52	354.5[illegible]	354.16
31	352.60	352.60	......	354.50	......	354.15	354.80	......	355.28	......	354.25	......

OSWEGO RIVER ABOVE UPPER DAM, FULTON

Gage No. 176

The record previously published as " above Oswego Falls Dam, Fulton," is from a gage located a short distance above the dam on the river side of the upper approach wall to Barge canal lock No. 2, and was discontinued, November 30, 1914. Gagings on the other side of the wall, *i. e.* in the approach to the lock, giving the water-surface above the dam more correctly than those on the river side of the wall, were begun June 7, 1912. On August 9, 1916, the staff gage was replaced by a standard Type A gage, No. 176, erected at the south end of the upper west gate recess of lock No. 2, and having a range of 12 feet, between elevations 349.0 and 361.0. A standard bench-mark plug was set in the wall near the gage at elevation 358.0 (B. C. datum).

The gage was read twice daily to half-tenths — at 6 A. M. and 6 P. M., July 1 to November 26 and May 4 to June 30, and at 8 A. M. and 4 P. M., November 27 to May 3.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER ABOVE UPPER DAM, FULTON, for the year ended June 30, 1919. Ed. L. Parker, H. H. Carlin and Bernard Malis, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	353.98	352.82	352.40	354.15	354.25	354.10	354.45	354.60	353.65	354.70	354.75	354.55
2.....	353.35	352.95	352.70	354.32	354.20	354.10	353.98	355.35	354.15	355.40	354.55	354.25
3.....	352.85	352.70	352.75	353.10	354.35	353.95	354.62	354.70	354.40	354.60	354.75	354.10
4.....	353.60	352.50	352.85	353.90	354.25	353.78	354.85	354.20	354.30	354.80	354.55	353.80
5.....	354.20	353.20	352.80	353.30	354.10	353.50	355.28	354.20	353.75	355.40	354.80	354.05
6.....	354.10	352.85	352.90	353.60	353.92	353.35	354.80	354.15	353.85	355.90	355.10	354.05
7.....	354.05	353.00	353.00	353.62	353.82	353.85	354.55	353.65	353.80	355.35	355.05	354.15
8.....	353.60	352.75	352.90	353.60	353.58	354.35	354.25	354.00	353.65	354.80	354.70	354.10
9.....	353.05	352.85	352.95	354.08	353.65	353.75	354.20	354.32	354.95	354.20	354.10	354.40
10.....	353.00	352.90	352.90	353.92	353.80	353.98	354.40	354.15	355.50	354.75	354.60	354.30
11.....	353.12	352.85	353.05	353.50	353.65	354.25	354.25	353.15	355.40	353.55	355.15	354.15
12.....	353.12	353.30	352.95	354.18	353.60	353.98	354.50	352.90	355.40	355.15	354.65	354.35
13.....	353.65	352.80	353.00	353.42	354.00	353.60	354.30	352.70	355.20	355.55	355.00	353.90
14.....	354.15	352.75	353.02	353.50	353.45	354.30	354.00	353.30	354.95	355.15	354.55	353.85
15.....	353.85	352.80	353.20	353.65	353.20	354.75	354.00	353.65	355.05	354.75	354.25	353.95
16.....	352.95	352.65	353.35	353.50	354.05	354.65	354.05	354.45	355.50	354.45	354.20	354.00
17.....	352.90	353.00	353.15	353.30	353.95	355.25	354.45	354.28	355.30	354.10	354.15	354.10
18.....	352.95	352.90	353.02	353.60	353.85	355.15	354.15	353.50	355.32	353.95	354.70	353.70
19.....	352.85	352.95	353.30	353.95	354.00	354.90	354.72	353.30	355.55	354.00	354.55	354.00
20.....	353.00	352.90	353.42	354.10	353.95	354.25	354.65	353.10	355.65	354.80	354.25	353.10
21.....	353.55	352.75	354.12	353.80	353.58	354.60	354.30	352.90	355.55	354.20	354.30	353.25
22.....	353.70	352.95	354.38	353.90	353.85	354.90	354.10	353.05	355.60	354.70	354.10	353.65
23.....	353.05	352.78	354.25	353.95	353.90	353.30	354.52	353.80	356.00	354.60	354.50	353.60
24.....	352.90	352.90	353.60	353.90	354.20	354.30	355.05	353.55	355.40	354.40	355.00	353.00
25.....	352.95	353.00	354.45	353.82	353.70	355.10	355.42	353.00	355.15	353.90	355.05	353.00
26.....	352.90	352.80	353.95	354.55	353.50	354.42	355.38	353.05	355.10	354.60	354.85	352.95
27.....	352.80	352.98	354.25	354.65	353.65	354.25	355.18	353.15	355.30	354.90	354.25	352.80
28.....	353.40	353.12	354.48	354.45	354.30	354.05	355.05	353.20	354.45	354.50	354.00	353.00
29.....	353.40	352.85	354.50	353.45	353.78	354.55	354.85	......	354.10	355.35	354.25	353.80
30.....	352.90	352.85	354.15	354.00	354.35	354.55	354.85	......	355.40	354.95	354.00	353.85
31.....	352.85	352.85	......	354.25	......	354.30	354.68	......	354.90	......	353.95	......

OSWEGO RIVER BELOW UPPER DAM, FULTON

Gage No. 175

This station was established February 11, 1913, as gage "No. 66 about 2,300 feet above lower dam," Fulton, which is practically the same location as that occupied by direct-reading staff gage at the end of the west lower approach wall to Barge canal lock No. 2, which was replaced on August 10, 1916, by a standard Type B gage, No. 175, erected at the same location and having a range of 12 feet, between elevations 333.0 and 345.0. A standard bench-mark plug was set in the wall near the gage at elevation 340.0 (B. C. datum).

The gage is read twice daily to half-tenths — at 6 A. M. and 6 P. M., July 1 to November 26 and May 4 to June 30, and at 8 A. M. and 4 P. M., November 27 to May 3.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER BELOW UPPER DAM FULTON, for the year ended June 30, 1919. Ed. L. Parker, H. H. Carlin and Bernard Malis, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	335.90	334.92	335.45	336.32	337.10	336.15	335.65	335.75	335.45	336.95	337.60	338.35
2	335.45	335.15	335.52	336.65	336.80	336.20	335.88	336.05	336.25	336.95	337.70	338.00
3	334.78	334.70	334.80	336.40	337.25	335.90	335.95	335.95	336.35	336.95	337.65	337.60
4	335.78	335.60	335.00	336.32	337.15	335.80	335.80	335.50	335.70	336.95	338.10	337.05
5	335.55	335.25	335.25	336.65	336.95	335.78	336.65	335.40	335.65	337.10	337.50	336.80
6	334.95	334.80	335.10	336.30	337.05	335.70	336.15	334.80	335.70	337.80	337.25	336.40
7	335.90	334.90	335.35	336.80	336.90	336.20	336.00	335.18	335.68	337.40	337.20	336.45
8	335.60	335.05	335.52	336.55	336.85	336.35	335.85	335.20	335.50	337.30	337.40	337.10
9	334.35	334.20	335.55	336.55	336.72	335.95	335.85	335.95	336.40	337.15	337.10	336.40
10	334.15	335.00	335.10	336.38	336.88	335.72	335.50	335.70	336.55	337.50	337.00	336.60
11	334.50	335.40	335.10	336.20	337.00	335.95	335.35	335.35	336.75	337.30	338.15	336.55
12	334.78	335.30	335.50	336.75	636.60	335.75	336.00	335.35	336.85	337.85	338.30	336.70
13	335.10	334.65	335.25	336.75	336.30	335.65	335.80	334.00	336.65	338.65	338.10	336.65
14	335.95	334.85	335.45	336.75	336.15	336.00	335.70	334.40	336.35	338.45	338.25	336.70
15	335.95	334.50	335.80	336.65	336.00	337.00	335.85	335.50	336.50	338.15	338.15	337.05
16	334.70	334.50	335.78	336.39	335.88	336.50	335.30	336.05	336.90	338.00	337.75	336.30
17	334 85	334.90	335.70	336.20	336.70	336.45	335.85	336.10	336.75	337.85	337.75	335.80
18	334.95	335.48	335.72	336.25	336.95	336.35	335.20	335.40	336.75	337.80	338.05	335.75
19	334.45	335.05	335.65	336.10	336.70	336.15	336.50	335.40	336.95	337.55	338.00	335.95
20	334.95	334.90	336.02	336.40	336.72	336.00	335.82	335.40	337.00	337.95	337.55	335.60
21	335.25	335.08	336.10	336.42	336.40	335.92	336.02	335.40	337.00	337.35	337.80	335.25
22	335.45	334.80	336.62	336.28	336.45	336.80	335.45	335.40	336.98	337.15	337.65	336.15
23	335.25	334.95	336.70	336.35	336.10	335.72	335.20	335.70	337.50	335.15	338.05	335.75
24	334.95	335.00	336.28	336.15	336.70	336.50	335.75	335.95	337.10	337.20	338.50	335.45
25	335.10	335.40	336.12	336.02	336.40	337.35	335.95	335.90	336.75	336.95	338.95	335.40
26	335.25	335.15	336.48	336.52	335.80	336.85	336.68	335.65	336.85	337.25	338.70	335.50
27	335.10	334.68	336.72	336.82	335.90	336.70	336.12	335.88	336.95	337.90	338.40	334.80
28	335.30	335.12	336.50	337.15	335.28	336.45	335.82	335.50	336.60	337.55	338.40	334.90
29	335.55	335.15	336.62	336.80	335.90	337.05	335.75	......	336.50	337.35	338.20	336.00
30	335.35	334.95	336.68	336.70	335.82	336.05	335.75	......	337.35	337.60	338.20	335.70
31	344.80	335.38	......	337.00	......	335.90	335.70	......	337.20	......	338.10	......

OSWEGO RIVER ABOVE LOWER DAM, FULTON

Gage No. 174

This station was established December 9, 1909, to obtain water-surface elevations only. The record has been taken at one or the other of two gages, giving practically the same readings, *i. e.* gage No. 54 on west bank about 600 feet above the dam and gage No. 64 on east side of river about 700 feet above dam.

A direct-reading staff, located on the east side of the river on the retaining wall just inside the south end of the open docking approach above Barge canal lock No. 3, was replaced on August 10, 1916, by a standard Type B gage, No. 174, erected at the same location and having a range of 12 feet, between elevations 332.0 and 344.0. A standard bench-mark plug was set in the face of the wall at elevation 340.0 (B. C. datum).

The gage was read twice daily to half-tenths — at 6 A. M. and 6 P. M., July 1 to November 25 and May 6 to June 30, and at 8 A. M. and 4 P. M., November 26 to May 25.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER ABOVE LOWER DAM, FULTON, for the year ended June 30, 1919. H. H. Carlin, Observer

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	335.78	334.85	335.55	336.30	337.05	336.35	335.80	335.70	335.45	337.05	337.50	338.30
2	334.88	335.18	335.50	336.63	336.95	336.20	335.88	336.50	336.28	337.05	337.6[illegible]	338.00
3	334.80	334.70	334.85	336.45	337.10	335.82	336.05	335.60	336.25	337.00	337.62	337.55
4	335.70	335.55	335.00	336.30	337.12	335.80	335.85	335.45	335.85	337.05	338.10	337.05
5	335.55	335.40	335.15	336.48	337.00	335.75	336.70	335.35	335.72	337.20	337.6[illegible]	336.80
6	335.08	334.90	335.00	336.55	336.95	335.70	336.10	334.75	335.70	337.58	337.15	336.20
7	336.18	334.98	335.28	336.70	336.80	335.35	336.00	335.02	335.70	337.40	337.20	336.55
8	335.60	335.15	335.45	336.52	336.70	336.35	335.82	335.30	335.55	337.35	337.40	337.25
9	334.32	335.15	335.32	336.38	336.75	335.90	335.85	335.95	336.45	337.22	337.10	337.00
10	334.20	335.10	335.15	336.30	336.80	335.70	335.50	335 85	336.58	337.58	337.0[illegible]	336.55
11	334.52	335.40	335.15	336.20	336.05	335.98	335.35	335.15	336.80	337.38	338.3[illegible]	336.60
12	334.70	335.35	335.45	336.22	336.55	335.75	335.95	335.30	336.90	337.90	338.35	336.80
13	335.12	334.62	335.28	336.72	336.45	335.70	335.80	333.95	336.65	338.7	338.15	336.70
14	335.90	334.78	335.22	336.75	336.12	336.05	335.70	334.40	336.40	338.50	338.25	336.60
15	336.00	334.55	335.65	336.45	336.00	337.05	335.60	335.55	336.35	338.15	338.10	337.05
16	334.70	334.48	335.80	336.42	335.85	336.45	335.35	336.25	336.85	338.00	337.8[illegible]	336.35
17	334.70	334.85	335.75	336.25	336.60	335.92	335.80	335.85	336.85	337.98	337.8[illegible]	335.95
18	334.75	335.50	335.58	336.20	336.95	336.35	335.20	335.50	336.80	337.62	338.25	335.90
19	334.48	334.98	335.78	336.15	336.70	336.20	336.45	335.40	336.90	337.55	338.00	335.95
20	334.88	334.85	336.10	336.45	336.50	336.05	335.80	335.45	307.05	338.05	337.55	335.35
21	335.72	335.08	336.12	336.40	336.55	335.98	335.48	335.45	337.10	337.35	337.8[illegible]	335.35
22	335.40	334.75	336.48	336.20	336.35	336.92	335.45	335.45	337.00	337.15	337.68	336.30
23	335.28	334.88	336.35	336.15	336.08	335.75	335.15	335.80	337.50	337.40	338.20	335.70
24	334.80	335.02	336.22	336.15	336.85	336.55	335.85	336.05	337.08	337.15	338.55	335.30
25	335.20	335.38	336.05	336.05	336.45	337.35	336.00	335.95	336.85	337.05	339.0[illegible]	335.38
26	335.28	335.15	336.45	336.45	335.90	336.92	336.75	335.70	336.85	337.28	338.85	335.35
27	335.05	334.68	336.55	336.80	335.90	336.72	336.15	335.88	337.15	337.95	338.45	334.60
28	335.65	335.28	336.55	337.10	335.25	336.50	335.88	335.58	336.68	337.62	338.45	334.85
29	335.45	335.22	336.85	336.62	335.90	337.10	335.80	......	336.85	337.38	338.10	336.00
30	335.30	335.10	336.75	336.65	335.35	336.00	335.70	......	337.32	337.60	338.25	335.10
31	334.80	335.35	......	336.88	......	335.95	335.70	......	337.18	......	338.05	......

OSWEGO RIVER BELOW LOWER DAM, FULTON

Gage No. 173

This station was established April 1, 1909, as gage No. 47 at end of east lower approach wall to and about 1,100 feet below Barge canal lock No. 3. The gage is at present located on the east lower approach wall immediately below lock No. 3 and under the Oneida street bridge. A direct-reading staff was replaced on August 11, 1916, by a standard Type A gage, No. 173, in two sections, erected at the same location. The lower section has a range of 8 feet, between elevations 306.0 and 314.0, and the upper section has a range of 4 feet, between elevations 314.0 and 318.0. A standard bench-mark plug was set in the face of the wall near the upper section at elevation 317.0 (B. C. datum). The record obtained at these gages is the elevation of the river at its junction with the canal at the lower end of a dike separating the canal and river for a distance of about 3,500 feet below lock No. 3.

The gage was read twice daily to half-tenths — at 6 A. M. and 6 P. M., July 1 to November 25 and May 6 to June 30, and at 8 A. M. and 4 P. M., November 26 to May 25.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER BELOW LOWER DAM, FULTON, for the year ended June 30, 1919. H. H. Carlin, Observer.

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	308.5	308.05	307.85	308.3	309.35	308.15	308.45	309.1	308.35	309.8	310.7	310.85
2.....	308.25	308.08	307.9	308.5	308.9	308.65	308.55	308.95	308.15	309.65	310.9	310.85
3.....	307.95	308.05	308.0	308.35	308.9	308.55	308.6	308.55	308.8	309.6	311.0	310.7
4.....	307.95	308.0	308.0	308.45	308.9	308.65	308.55	308.32	308.62	309.8	310.4	309.65
5.....	308.0	308.0	308.05	302.5	300.1	308.48	308.55	308.35	308.6	310.2	310.0	308.85
6.....	308.0	307.9	308.0	308.35	308.85	308.48	309.25	308.35	308.5	309.8	310.25	308.7
7.....	308.0	307.98	308.1	308.5	308.95	308.55	308.9	308.3	308.55	310.5	310.05	308.9
8.....	308.15	308.05	307.9	308.45	309.1	308.6	308.45	308.3	308.4	310.4	310.15	308.65
9.....	308.0	308.15	307.95	308.45	308.75	308.7	308.55	308.4	308.2	310.3	309.75	308.75
10.....	307.9	308.0	307.95	308.5	308.65	308.5	308.9	308.6	309.05	310.7	309.45	308.95
11.....	308.05	308.05	308.0	308.45	308.7	308.6	308.5	308.3	309.35	310.7	310.9	308.7
12.....	308.15	307.95	307.95	308.4	308.55	308.5	308.25	308.3	309.6	311.5	311.25	309.1
13.....	308.1	308.1	308.0	308.6	308.55	308.42	309.02	308.3	309.35	311.6	311.4	309.2
14.....	308.0	308.05	308.0	308.7	308.65	308.5	308.75	308.3	308.9	312.45	311.6	308.75
15.....	308.2	307.95	307.85	308.7	308.5	308.5	308.7	308.4	308.75	312.15	311.45	308.65
16.....	308.2	307.95	308.0	308.55	308.4	309.05	308.55	308.3	308.9	311.8	310.7	308.55
17.....	308.15	308.05	308.15	308.5	308.42	309.55	308.7	308.6	309.2	311.65	310.75	308.5
18.....	308.12	307.95	308.0	308.3	309.0	309.15	308.5	308.25	309.35	311.4	310.75	308.6
19.....	308.15	307.95	308.05	308.25	309.08	308.75	308.4	308.45	309.6	311.0	310.75	308.5
20.....	308.1	308.0	308.15	308.25	309.1	308.6	308.75	308.45	309.85	310.25	310.5	308.15
21.....	307.88	307.9	308.2	308.5	308.85	308.55	308.4	308.25	309.85	310.5	311.0	308.2
22.....	308.18	307.95	308.2	308.45	308.75	308.6	308.42	308.2	309.65	310.05	311.1	308.2
23.....	308.18	307.95	308.45	308.4	308.52	308.5	308.3	308.05	308.5	310.15	312.15	308.05
24.....	308.18	308.0	308.45	308.35	308.55	308.9	308.65	308.32	309.65	310.3	312.2	308.05
25.....	308.15	307.85	308.15	308.45	308.45	308.85	309.35	308.28	309.12	310.0	312.55	308.1
6.....	308.2	307.8	308.45	308.6	308.5	309.45	308.4	308.35	309.0	310.0	312.2	308.05
7.....	308.05	308.0	308.4	308.6	308.48	309.22	308.55	308.4	309.25	310.2	312.05	308.15
8.....	308.1	307.85	308.4	308.75	308.15	308.9	308.45	308.35	309.5	310.45	312.0	308.2
9.....	308.15	307.95	308.45	308.8	308.5	308.45	308.45	......	309.05	310.5	311.45	308.05
0.....	308.2	307.95	308.55	308.85	308.45	308.8	308.4	......	308.8	310.95	311.35	308.2
1.....	308.0	308.0	......	309.05	......	308.6	308.5	......	309.9	......	311.2	......

OSWEGO RIVER AT MINETTO

Gages Nos. 171 and 172

At Minetto a new curved dam (No. 5) with fixed concrete ogee crest 500 feet long at elevation 308.0, radius 192 feet, has been built immediately above the old straight dam, crest elevation 297.3, which has been removed. The upper pool was raised and water first flowed over new crest October 5, 1914.

Location.— In the village of Minetto at new Barge canal dam No. 5, about five miles above the mouth of the Oswego river.

Drainage area.— 5,091 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— Water-surface elevations above and below old or new dam, April 18, 1904, to June 30, 1919. Discharge, October 1, 1914, to June 30, 1919.

Gages.—Above dam, until August 18, 1916, direct-reading staff on wing of retaining wall, west bank, about 400 feet upstream from dam. Since August 18, a standard Type A gage, No. 172, erected at the end of upper east gate recess of lock No. 5, and having a range of 11½ feet, between elevations 304.0 and 315.5. A standard bench-mark plug was set in the wall near the gage at elevation 314.0 (B. C. datum).

Below dam, until August 18, 1916, concrete gage just below lower gates of lock No. 5. Since August 18, a standard Type B gage, No. 171, erected on the end of the lower west approach wall to lock No. 5, and having a range of 12 feet, between elevations 288.0 and 300.0. A standard bench-mark plug was set in the wall near the gage at elevation 296.0 (B. C. datum).

These gages were read twice daily to tenths — at 8 A. M. and 4 P. M., July 1 to May 6, and at 6 A. M. and 6 P. M., May 7 to June 30.

Discharge measurements.— Flow over crest and through power-wheels calculated from hourly readings furnished by the Niagara, Lockport and Ontario Power Company, lessee. Wheels not tested in place. Discharge over dam from curve prepared by this Department. During lower stages the power-plant uses all water available, the pool being drawn down to crest of dam. Water used for canal purposes estimated by this Department.

Control.— Dam crest, Barge canal lock No. 5 and power-plant of the Northern New York Power Company. The latter started testing wheels September 8, 1915.

Extremes of discharge.— Current year: Maximum mean daily discharge, 16,000 second-feet on May 26. Minimum mean daily discharge, 350 second-feet on September 1.

1915–1919: Maximum stage recorded, elevation 313.35, April 5, 1916; discharge, 30,900 second-feet. Minimum stage recorded, September 1, 1918; discharge, 350 second-feet.

Regulation.— By the large number of lakes in the drainage area and by pondage at Fulton and Phoenix.

Accuracy.— It is believed that the water passed through the wheels is somewhat underestimated, due to the lack of actual tests of wheels in place, but that the estimated discharge at this station is nearer correct than that obtained at High dam, which is based on only one or two daily readings.

Coöperation.— Discharge data furnished as above by the Niagara, Lockport and Ontario Power Company.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER ABOVE DAM AT MINETTO, for the year ended June 30, 1919. H. M. Searles, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	308.0	308.0	308.0	308.05	308.2	308.0	308.1	308.8	308.15	308.9	309.45	309.7
2	308.05	308.1	308.0	308.1	308.15	308.1	308.1	308.65	308.15	308.75	309.85	309.8
3	308.0	308.05	308.1	308.15	308.1	308.15	308.05	308.15	308.2	308.65	309.9	309.55
4	308.05	308.0	308.0	308.0	308.45	308.25	308.05	308.1	308.25	308.9	309.4	308.75
5	308.1	308.1	308.1	308.05	308.25	308.05	308.05	308.0	308.1	309.2	309.45	308.15
6	308.05	308.0	308.05	308.1	308.2	308.05	308.1	308.0	308.15	309.05	309.45	308.15
7	308.0	308.05	308.05	308.15	308.25	308.2	308.1	308.05	308.15	309.4	309.15	308.2
8	308.05	308.0	308.05	308.1	308.1	308.05	308.2	308.1	308.15	309.35	309.1	308.15
9	308.0	308.15	308.1	308.1	308.1	308.1	308.15	308.05	308.1	309.2	308.85	308.15
10	308.05	308.1	308.0	308.05	308.05	308.1	308.1	308.1	308.2	309.65	308.55	308.2
11	308.05	308.05	308.05	308.15	308.05	308.1	308.1	308.15	308.5	309.6	309.8	308.1
12	308.05	308.1	308.05	308.15	308.15	308.1	308.05	308.05	308.9	310.25	310.1	308.3
13	308.05	308.1	308.1	308.15	308.05	308.1	308.0	308.05	308.4	310.25	310.15	308.45
14	308.0	308.1	308.0	308.25	308.05	308.15	308.05	308.15	308.15	310.9	310.3	308.1
15	308.15	308.1	308.0	308.05	308.1	308.05	308.05	308.1	308.15	310.8	310.25	308.05
16	308.05	308.1	308.1	308.1	308.0	308.3	308.05	308.05	308.1	310.6	309.85	308.0
17	308.15	308.05	308.05	308.05	308.05	308.65	308.05	308.25	308.4	310.35	309.65	308.05
18	308.05	308.0	308.05	308.05	308.35	308.4	308.05	308.15	309.3	310.1	309.6	308.1
19	308.05	308.05	308.05	308.0	308.2	308.2	308.1	308.15	309.2	309.85	309.7	308.0
20	308.0	308.0	308.1	308.05	308.25	308.1	308.05	308.25	308.95	309.35	309.55	308.1
21	308.0	308.05	308.1	308.05	308.1	308.1	308.1	308.1	308.85	309.4	309.85	308.0
22	308.15	308.05	308.1	308.05	308.15	308.1	308.05	308.1	308.65	309.1	310.0	308.0
23	308.1	308.05	308.15	308.05	308.05	308.1	308.05	308.0	308.15	309.25	311.1	308.0
24	308.05	308.0	308.05	308.1	308.0	308.15	308.1	308.2	308.75	309.25	310.8	308.05
25	308.05	308.0	308.05	308.1	308.0	308.1	308.8	308.05	308.3	308.95	311.25	308.1
26	308.05	308.05	308.0	308.1	308.1	308.5	308.15	308.15	308.25	308.85	310.75	308.0
27	308.1	308.0	308.2	308.15	308.1	308.35	308.15	308.1	308.35	309.05	310.7	308.1
28	308.05	308.1	308.05	308.1	308.1	308.15	308.1	308.15	308.6	309.3	310.7	308.0
29	308.1	308.05	308.05	308.15	308.1	308.05	308.1	......	308.1	309.45	310.25	308.0
30	308.1	308.05	308.05	308.1	308.15	308.1	308.1	......	308.15	309.8	310.15	308.15
31	308.1	308.0	......	308.2	......	308.05	308.05	......	308.9	......	309.95	......

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER BELOW DAM AT MINETTO, for the year ended June 30, 1919. H. M. Searles, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	292.3	291.55	291.0	292.15	292.95	291.65	292.35	291.9	292.25	293.35	293.8	294.0
2.....	292.3	291.55	291.2	292.2	293.15	292.35	292.35	291.8	291.75	293.25	294.0	294.0
3.....	291.55	291.35	291.4	292.4	292.7	292.35	292.55	292.25	292.65	293.2	293.9	293.9
4.....	291.25	290.95	291.35	292.1	292.7	292.1	292.5	292.1	292.55	293.35	293.7	293.35
5.....	292.0	291.8	291.5	292.15	293.0	292.3	292.25	292.15	292.5	293.5	293.75	292.8
6.....	291.65	291.4	291.35	291.85	293.05	292.2	292.7	292.1	292.45	293.4	293.75	292.7
7.....	291.85	291.65	291.35	292.4	292.7	292.05	292.7	292.15	292.3	293.65	293.55	292.85
8.....	291.95	291.4	290.75	292.45	292.55	291.95	292.55	291.95	292.2	293.6	293.5	292.85
9.....	291.85	291.45	291.6	292.35	292.65	292.4	292.5	291.4	291.75	293.45	293.4	292.85
10.....	291.65	291.5	291.35	292.35	292.25	292.4	292.4	292.35	292.95	293.75	293.15	292.9
11.....	291.9	290.8	291.5	292.15	292.55	292.3	292.35	292.25	293.1	293.75	293.95	292.85
12.....	292.05	291.85	291.4	292.15	292.85	292.35	291.85	292.05	293.35	294.25	294.2	92.55
13.....	292.0	291.75	291.55	292.15	292.7	292.2	292.65	291.95	293.15	294.35	294.3	293.1
14.....	291.4	291.5	291.45	292.45	292.55	292.3	292.4	291.8	293.0	294.8	294.35	292.65
15.....	292.3	291.35	290.95	292.55	292.65	292.45	292.4	292.25	292.8	294.65	294.3	292.7
16.....	291.9	291.35	291.6	292.45	292.45	292.85	292.35	291.7	292.4	294.5	294.05	292.65
17.....	292.1	291.6	291.5	292.35	292.3	293.25	292.3	292.25	293.05	294.45	293.95	292.7
18.....	291.95	290.9	291.8	292.25	292.95	293.05	292.25	292.15	293.05	294.2	293.9	292.55
19.....	291.8	291.65	291.65	292.05	293.0	292.75	292.3	292.05	293.25	294.05	293.9	292.6
20.....	291.7	291.55	292.05	291.95	293.0	292.6	292.5	292.0	293.4	293.7	293.8	292.3
21.....	291.3	291.6	292.25	292.4	292.65	292.55	292.45	291.95	293.35	293.7	294.0	292.0
22.....	292.0	291.4	291.75	292.35	293.05	292.5	292.25	291.95	293.25	293.45	294.0	291.95
23.....	292.0	291.3	292.15	292.25	292.55	292.55	292.2	291.4	293.05	293.5	294.75	291.9
24.....	291.75	291.55	291.9	292.3	292.15	292.75	292.5	292.3	293.3	293.65	294.7	292.0
25.....	292.05	290.75	291.85	292.25	292.65	292.8	292.55	292.15	293.05	293.4	294.7	292.05
26.....	292.05	291.3	292.2	292.5	292.35	293.15	292.25	292.2	293.2	293.35	294.75	291.9
27.....	291.85	291.4	292.15	292.35	292.35	293.1	292.55	292.3	293.15	293.55	294.7	291.95
28.....	291.0	291.5	292.2	292.6	292.0	292.95	292.5	292.15	293.25	293.65	294.6	291.9
29.....	291.85	291.5	292.05	292.55	292.3	292.65	292.45	......	292.95	293.65	294.35	291.85
30.....	291.7	291.4	292.5	292.45	292.05	292.8	292.45	......	292.5	293.95	294.3	292.15
31.....	291.75	291.4	......	293.0	......	292.55	292.35	......	293.35	......	294.2	......

Daily discharge, in second-feet, of OSWEGO RIVER AT MINETTO, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	4,460	2,750	350	4,400	7,080	3,180	4,380	4,250	4,400	7,740	9,450	11,200
2.....	4,180	2,570	1,400	4,650	6,050	4,050	4,780	4,000	3,640	7,750	10,400	12,000
3.....	3,040	2,470	1,960	4,430	6,320	4,510	5,290	5,010	5,180	7,590	10,600	10,900
4.....	2,070	1,420	1,990	4,070	6,410	4,680	5,160	4,050	7,730	8,060	9,220	8,880
5.....	3,280	2,590	2,100	4,180	6,460	3,630	5,250	3,910	4,950	8,970	9,440	6,630
6.....	3,390	2,460	2,040	3,630	6,240	4,080	5,240	3,810	4,770	8,580	9,030	5,790
7.....	2,540	2,330	2,170	4,850	5,910	3,830	5,180	3,720	4,890	9,100	9,420	5,880
8.....	3,300	2,260	1,160	4,530	5,740	3,610	4,930	3,920	4,470	9,020	8,560	5,700
9.....	2,680	2,670	2,020	4,650	5,760	4,540	5,160	2,970	4,360	8,600	8,770	6,280
10.....	2,500	2,840	2,300	4,500	4,550	4,490	4,200	4,330	6,580	9,820	7,710	6,590
11.....	2,860	1,340	2,200	4,340	4,870	4,730	4,220	3,960	7,290	9,820	10,100	6,280
12.....	3,450	2,780	2,470	4,530	5,010	4,450	2,940	3,680	7,770	12,000	11,900	6,970
13.....	3,860	2,840	2,410	4,710	5,200	4,180	4,490	3,350	7,200	12,900	12,000	6,600
14.....	2,220	2,410	2,580	4,910	4,760	5,000	4,250	3,270	6,510	15,600	12,600	6,010
15.....	4,130	2,000	1,390	4,790	4,110	5,660	4,530	4,180	6,280	14,800	12,400	5,170
16.....	3,400	2,040	2,710	4,560	4,360	5,990	4,230	3,220	5,640	13,800	10,600	5,390
17.....	3,400	1,770	2,860	4,250	4,300	6,190	4,200	4,840	6,970	13,000	10,800	5,750
18.....	3,440	480	2,970	4,100	6,190	5,810	4,060	4,050	7,370	12,100	9,730	5,100
19.....	3,170	1,590	2,820	3,830	6,110	5,820	3,910	3,840	7,820	11,400	11,600	5,220
20.....	3,060	1,920	3,540	3,610	6,410	5,420	4,250	3,910	8,220	9,450	11,000	4,400

Daily discharge, in second-feet, of OSWEGO RIVER AT MINETTO, for the year ended June 30, 1919 —*Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
21	1,960	1,700	3,690	4,540	6,000	5,000	4,550	3,680	8,170	10,300	11,900	3,790
22	3,520	1,620	3,520	3,860	5,650	5,440	4,270	3,810	7,820	8,460	12,200	2,660
23	3,360	1,620	4,160	4,240	5,180	5,760	4,240	2,520	7,370	8,880	11,600	3,900
24	2,920	1,740	4,030	4,240	4,590	5,380	5,220	3,870	7,420	8,930	15,600	3,650
25	3,410	630	3,760	4,080	5,000	6,160	5,520	4,180	7,020	8,260	15,600	3,740
26	2,700	1,270	4,510	4,950	4,370	7,420	4,760	4,650	6,820	8,490	16,000	3,760
27	3,060	1,370	4,320	5,030	4,420	6,530	5,210	4,080	7,400	8,570	15,500	3,390
28	1,750	1,280	4,560	5,420	3,980	6,400	4,940	4,280	6,950	8,940	15,700	3,220
29	3,180	1,250	4,170	5,360	4,460	5,490	4,850	......	6,310	9,240	13,800	2,610
30	3,100	1,210	4,750	5,150	4,070	5,430	4,860	......	6,380	11,400	13,000	4,120
31	2,870	1,340	......	5,890	......	4,600	4,770	......	7,900	......	12,400	......
Mean	3,104	1,889	2,831	4,527	5,319	5,082	4,640	3,905	6,503	10,036	11,569	5,719

Monthly discharge of OSWEGO RIVER AT MINETTO, for the year ended June 30, 1919

[Drainage area, 5,091 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	4,460	1,750	3,104	0.609	0.70
August	2,840	480	1,889	0.371	0.43
September	4,750	350	2,831	0.556	0.62
October	5,890	3,610	4,527	0.889	1.02
November	7,080	3,980	5,319	1.045	1.17
December	7,420	3,180	5,082	0.998	1.15
January	5,520	2,940	4,640	0.911	1.05
February	5,010	2,520	3,905	0.767	0.80
March	8,220	3,640	6,503	1.277	1.47
April	15,600	7,590	10,036	1.971	2.20
May	16,000	7,710	11,569	2.272	2.62
June	12,000	2,610	5,719	1.123	1.25
The year	16,000	350	5,427	1.066	14.48

OSWEGO RIVER AT NEW HIGH DAM, OSWEGO

Gage No. 170

High dam (old) with fixed crest at about elevation 281.8 has been removed above elevation 268.0, having been submerged by the pool formed by new High dam (dam No. 6) located about a mile farther downstream with fixed concrete ogee crest 500 feet long at elevation 290.0. The new pool was filled January 7, 1915.

Location.—At Barge canal dam No. 6, known as new High dam, just south of the city of Oswego and about 2 miles above the mouth of the Oswego river.

Drainage area.— 5,097 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— Water-surface elevation above and below, January 1, 1915, to June 30, 1919. Discharge, January 7, 1915, to June 30, 1919.

Gages.—Above dam, until August 17, 1916, direct-reading staff on wing of east upper approach wall to lock No. 6, about 350 feet upstream from crest of dam. Since August 17, a standard Type B gage, No. 170, erected at the same location and having a range of 12 feet, between elevations 286.0 and 298.0. A standard bench-mark plug was set in the wall at elevation 296.0 (B. C. datum).

Below dam, until August 17, 1916, a direct-reading staff on wing of each lower approach wall to lock No. 6. Since August 17, a standard Type B gage, No. 169, erected at the same location and having a range of 12 feet, between elevations 265.0 and 277.0. A standard bench-mark plug was set in the face of the wall near the gage at elevation 274.0 (B. C. datum).

These gages were read twice daily to half-tenths — at 6 A. M. and 6 P. M., July 1 to November 25 and May 6 to June 30, and at 8 A. M. and 4 P. M., November 26 to May 5.

Discharge measurements.— Except the small amount required for canal purposes, the entire flow of the river ordinarily passes over the dam. Water used for canal purposes is included.

Control.— Crest, Barge canal lock No. 6 and bulkhead gates.

Extremes of discharge.— Current year: Maximum mean daily discharge, 19,200 second-feet on April 14. Minimum mean daily discharge, 1,680 second-feet on September 8.

1915–1919: Maximum stage recorded, elevation 296.3 on April 3, 4 and 5, 1916; discharge, 31,400 second-feet. Minimum stage recorded, elevation 287.2 on December 16, 1915, at 10 A. M.

Regulation.— By the large number of lakes in the drainage area and by pondage at Fulton and Phoenix.

Accuracy.— The one or two daily readings are not a sufficient basis for accurate discharge estimates, owing to the fluctuation

of flow caused by pondage and industrial wheels at Fulton and Phoenix. It is believed that the estimated discharge at this station is too high and that those obtained at Minetto, while possibly a little low, are nearer correct.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER ABOVE NEW HIGH DAM, OSWEGO, for the year ended June 30, 1919. James R. Kelly, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	292.15	291.58	291.10	292.05	292.85	291.60	292.40	291.85	292.20	293.25	293.50	293.70
2.....	292.10	291.48	291.12	292.32	292.68	292.30	292.45	292.30	291.60	293.20	293.80	293.70
3.....	291.82	291.65	291.25	292.20	292.80	292.30	292.60	292.30	292.55	293.15	293.65	293.60
4.....	291.55	291.12	291.35	292.12	292.88	292.25	292.50	292.15	292.45	293.25	293.55	293.15
5.....	291.72	291.38	291.52	292.02	292.90	292.10	292.10	292.10	292.45	293.40	293.50	292.80
6.....	291.95	291.50	291.45	292.35	292.80	292.20	292.50	292.10	292.40	293.25	293.40	292.60
7.....	291.75	291.58	201.22	292.28	292.78	292.05	292.50	292.15	292.30	293.55	293.35	292.70
8.....	291.92	291.52	290.98	292.35	292.72	291.80	292.40	291.95	292.15	293.50	293.35	292.65
9.....	291.62	291.68	291.10	292.30	292.68	292.35	292.30	291.60	291.90	293.40	293.20	292.70
10.....	291.55	291.72	291.45	292.12	292.50	292.35	292.20	292.25	292.75	293.60	293.10	292.80
11.....	291.58	291.62	291.50	292.15	292.35	292.40	292.15	292.05	293.00	293.65	293.80	292.70
12.....	291.88	291.40	291.40	292.05	292.25	292.25	291.65	291.90	293.15	294.05	294.00	292.95
13.....	291.85	291.50	291.50	292.22	292.50	292.25	292.35	291.90	293.00	294.10	294.00	293.05
14.....	291.55	291.70	291.35	292.55	292.25	292.32	292.20	291.85	292.85	294.55	293.90	292.55
15.....	291.90	291.70	291.18	292.38	292.18	292.35	292.25	292.40	292.70	294.40	294.00	292.65
16.....	291.98	291.65	291.48	292.28	292.32	292.70	292.20	291.65	292.35	294.30	293.70	292.50
17.....	291.70	291.38	291.65	292.12	292.22	292.70	292.20	292.15	292.95	294.10	293.70	292.55
18.....	291.68	291.05	291.95	292.25	292.72	292.95	292.15	292.10	292.85	294.00	293.60	292.50
19.....	291.88	291.20	291.82	292.10	292.85	292.60	291.70	292.00	293.20	293.75	293.70	292.50
20.....	291.60	291.50	292.00	292.02	292.85	292.55	292.30	292.00	293.25	293.45	293.60	292.10
21.....	291.55	291.38	292.10	292.02	292.68	292.45	292.30	292.00	293.20	293.45	293.75	291.95
22.....	291.82	291.38	292.02	292.12	292.65	292.45	292.15	292.00	293.00	293.30	293.65	291.85
23.....	291.85	291.45	292.12	292.15	292.50	292.15	292.10	291.30	293.00	293.40	294.15	292.00
24.....	291.55	291.40	292.05	292.08	292.25	292.75	292.45	292.30	293.00	293.40	294.45	292.00
25.....	291.62	291.12	291.82	292.12	292.50	292.75	292.45	292.10	293.00	293.25	294.45	291.90
26.....	291.55	291.15	292.18	292.32	292.20	293.05	292.20	292.15	292.90	293.20	294.45	291.85
27.....	291.78	291.25	292.10	292.38	292.25	293.05	292.45	292.20	293.00	293.30	294.40	291.90
28.....	291.45	291.45	292.05	292.60	292.20	292.95	292.40	292.10	293.00	293.50	294.30	291.85
29.....	291.55	291.42	292.25	292.70	292.25	292.55	292.40	......	292.75	293.55	294.05	291.65
30.....	291.80	291.45	292.35	292.45	292.15	292.55	292.40	......	292.70	293.75	293.95	292.00
31.....	291.80	291.32	......	292.72	......	292.55	292.25	......	293.20	......	293.95	......

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER BELOW NEW HIGH DAM, OSWEGO, for the year ended June 30, 1919. James R. Kelly, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	270.05	269.20	268.92	269.92	270.62	269.65	270.20	269.40	270.00	271.20	271.30	272.05
2.....	269.70	269.12	268.98	270.25	270.52	270.00	270.00	270.20	270.60	270.95	271.90	271.95
3.....	269.50	269.42	269.00	270.08	270.75	269.90	270.10	270.00	270.35	271.95	271.80	271.70
4.....	269.38	269.05	269.05	270.05	270.68	269.60	270.35	271.35	270.30	271.10	271.75	271.20
5.....	269.48	269.15	269.08	269.98	270.70	269.65	270.10	269.65	270.15	271.35	271.40	270.75
6.....	269.78	269.28	269.08	270.00	270.30	269.80	270.30	269.60	270.25	271.35	271.40	270.65
7.....	269.60	269.40	269.05	270.30	270.68	269.50	270.20	269.70	270.00	271.40	271.40	270.65
8.....	269.65	269.05	268.88	270.25	270.55	269.68	269.95	269.65	269.90	271.40	271.35	270.75
9.....	269.18	269.40	268.70	270.10	270.55	269.80	269.80	269.40	269.85	271.25	271.30	270.70
10.....	269.32	269.45	269.00	269.80	270.42	269.85	269.75	269.75	270.50	271.55	271.15	270.75

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER BELOW NEW HIGH DAM, OSWEGO, for the year ended June 30, 1919. James R. Kelly, Observer — *Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
11......	269.18	269.60	269.05	269.95	270.35	269.75	269.80	269.55	270.75	271.55	272.00	270.65
12......	269.45	269.25	269.15	270.00	269.95	269.80	269.65	269.45	270.95	272.10	271.75	270.85
13......	269.62	269.25	269.12	270.55	270.28	269.65	269.95	269.50	270.80	272.40	272.05	271.00
14......	269.20	269.32	269.10	270.58	270.40	269.80	269.80	269.30	270.65	272.45	272.20	270.60
15......	269.90	269.40	269.05	270.50	270.00	270.40	269.75	270.15	270.60	272.35	272.25	270.90
16......	269.60	269.28	269.32	270.38	270.05	270.45	269.70	269.55	270.35	272.30	272.00	270.55
17......	269.50	269.12	269.22	270.22	270.25	270.40	269.75	269.70	270.40	272.20	271.80	270.50
18......	269.52	268.88	269.65	270.35	270.55	270.70	269.80	269.60	270.60	272.00	271.85	270.35
19......	269.50	269.00	269.48	270.22	270.68	270.30	269.70	269.50	270.90	272.10	271.85	270.40
20......	269.28	269.08	269.68	270.20	270.60	270.40	269.90	269.45	271.05	271.60	271.55	269.95
21......	269.40	269.10	269.68	270.02	270.40	270.35	269.90	269.55	271.10	271.40	271.85	269.75
22......	269.65	269.10	270.05	270.12	270.50	270.05	269.70	269.65	271.10	271.20	271.70	269.90
23......	269.62	269.08	269.95	270.05	270.32	269.90	269.70	269.20	271.10	271.25	272.35	269.90
24......	269.22	269.20	269.68	270.00	270.35	270.40	270.05	269.90	270.85	271.30	272.75	269.70
25......	269.25	269.05	269.58	270.02	270.30	270.75	270.15	269.60	270.70	271.20	272.75	269.65
26......	269.15	268.85	269.95	270.20	269.80	270.65	270.20	269.65	270.70	271.15	272.55	269.50
27......	269.70	268.55	269.85	270.48	269.80	270.70	270.15	269.90	270.75	271.50	272.50	269.65
28......	269.52	269.15	269.95	270.42	269.85	270.65	270.10	269.80	270.90	271.35	272.40	269.65
29......	269.50	268.95	270.25	270.55	269.90	270.45	270.05	......	270.55	271.40	272.15	269.65
30......	269.65	269.05	270.20	270.20	269.85	270.15	270.10	......	270.75	271.65	272.20	270.00
31......	269.50	269.00	......	270.48	......	270.00	269.90	......	271.00	......	272.20	......

Daily discharge, in second-feet, of OSWEGO RIVER AT NEW HIGH DAM, OSWEGO, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	5,950	3,640	2,040	5,530	9,320	3,720	7,080	4,680	6,170	11,400	12,800	14,000
2......	5,740	3,280	2,100	6,730	8,460	6,620	7,320	6,620	3,710	11,200	14,600	14,000
3......	4,560	3,900	2,500	6,180	9,060	6,630	8,040	6,620	7,800	10,900	13,700	13,400
4......	3,530	2,090	2,840	5,840	9,470	6,400	7,560	5,950	7,320	11,400	13,100	10,900
5......	4,170	2,940	3,420	5,400	9,570	5,730	5,730	5,730	7,320	12,300	12,800	9,060
6......	5,100	3,350	3,170	6,870	9,060	6,170	7,560	5,730	7,080	11,400	12,300	8,050
7......	4,290	3,650	2,400	6,540	8,960	5,520	7,560	5,950	6,620	13,100	13,000	8,550
8......	4,970	3,420	1,680	6,870	8,650	4,480	7,080	5,090	5,950	12,800	13,000	8,300
9......	3,780	4,020	2,030	6,640	8,460	6,860	6,620	3,710	4,880	12,300	11,200	8,540
10......	3,530	4,170	3,170	5,840	7,580	6,860	6,170	6,390	8,790	13,400	10,600	9,060
11......	3,660	3,790	3,350	5,960	6,870	7,080	5,950	5,510	10,100	13,700	14,600	8,540
12......	4,810	3,000	2,990	5,540	6,410	6,390	3,890	4,880	10,900	16,100	15,800	9,830
13......	4,680	3,360	3,350	6,280	7,580	6,390	6,850	4,880	10,100	16,400	15,800	10,300
14......	3,530	4,090	2,820	7,820	6,420	6,710	6,170	4,680	9,300	19,200	15,200	7,810
15......	4,890	4,090	2,270	7,010	6,100	6,850	6,390	7,080	8,540	18,200	15,800	8,300
16......	5,230	3,900	3,280	6,540	6,740	8,540	6,170	3,890	6,850	17,600	14,000	7,570
17......	4,090	2,930	3,900	5,850	6,290	8,540	6,170	5,950	9,820	16,400	14,000	7,800
18......	4,020	1,900	5,100	6,410	8,660	9,820	5,950	5,730	9,300	15,800	13,400	7,560
19......	4,800	2,340	4,560	5,750	9,320	8,040	4,080	5,300	11,200	14,300	14,000	7,570
20......	3,710	3,350	5,310	5,400	9,320	7,800	6,620	5,300	11,400	12,500	13,400	5,730
21......	3,530	2,930	5,730	5,400	8,460	7,320	6,620	5,300	11,200	12,500	14,300	5,100
22......	4,580	2,930	5,390	5,840	8,320	7,320	5,950	5,300	10,100	11,700	13,700	4,680
23......	4,690	3,170	5,820	5,960	7,590	5,950	5,730	2,660	10,100	12,300	16,700	5,300
24......	3,530	3,000	5,520	5,660	6,410	8,790	7,320	6,620	10,100	12,300	18,600	5,320
25......	3,780	2,100	4,560	5,840	7,590	8,790	7,320	5,730	10,100	11,400	18,600	4,890
26......	3,540	2,180	6,080	6,730	6,190	10,300	6,170	5,950	9,560	11,200	18,600	4,680
27......	4,420	2,500	5,730	7,010	6,420	10,300	7,320	6,170	10,100	11,700	18,300	4,900
28......	3,170	3,170	5,520	8,060	6,200	9,820	7,080	5,730	10,100	12,800	17,600	4,690
29......	3,540	3,070	6,400	8,550	6,420	7,800	7,080	......	8,790	13,100	16,100	3,900
30......	4,480	3,180	6,850	7,340	5,930	7,800	7,080	......	8,540	14,300	15,500	5,310
31......	4,480	2,730	......	8,650	......	7,800	6,390	......	11,200	......	15,500	......
Mean...	4,283	3,167	3,996	6,453	7,729	7,327	6,549	5,460	8,808	13,457	14,729	7,788

Monthly discharge of OSWEGO RIVER AT NEW HIGH DAM, OSWEGO, for the year ended June 30, 1919

[Drainage area, 5,097 square miles]

Month	Discharge in Second-Feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	5,950	3,170	4,283	0.840	0.97
August	4,170	1,900	3,167	0.621	0.72
September	6,850	1,680	3,996	0.784	0.87
October	8,650	5,400	6,453	1.266	1.46
November	9,570	5,980	7,729	1.516	1.69
December	10,300	3,720	7,327	1.438	1.66
January	8,040	3,890	6,549	1.285	1.48
February	7,080	2,660	5,469	1.073	1.12
March	11,400	3,710	8,808	1.728	1.99
April	19,200	10,900	13,457	2.640	2.94
May	18,600	10,600	14,729	2.890	3.33
June	14,000	3,900	7,788	1.528	1.70
The year	19,200	1,680	7,480	1.468	19.93

OSWEGO RIVER ABOVE CURVED DAM, OSWEGO

Gage No. 2

The record heretofore published as "Oswego River above Curved Dam" is that obtained at gage No. 2 on the west side of the river. This gage was established April 7, 1904, and until December 10, 1916, consisted of a staff gage secured to the north face of the third pier south of, and part of, the upper approach to the Varick canal lock at the west end of the curved dam at Oswego. Since December 12, 1916, a standard Type A gage in the same location has been used. This gage has a range of 10 feet, between elevations 266.0 and 276.0 (B. C. datum), and is read once daily. It indicates the water-surface about 100 feet above the dam.

This gage should not be confused with the gage at the east end of the dam, whose record is published as "Oswego River, East Side, above Curved Dam, Oswego."

This gage is read once daily — at 8 A. M. — to tenths, with occasional readings to half-tenths.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER, ABOVE CURVED DAM, OSWEGO, for the year ended June 30, 1919. D. D. Tompkins, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	269.7	268.7	269.2	270.0	270.5	269.7	270.1	268.2	270.0	271.3	271.4
2	269.5	268.8	269.0	270.0	270.5	269.9	270.0	269.3	270.0	270.8	271.9
3	268.3	268.3	267.8	270.0	270.8	269.7	270.1	269.5	269.9	270.8	271.7
4	268.7	268.9	268.4	269.8	270.5	269.7	270.0	269.5	270.4	271.0	271.7
5	269.0	269.8	269.0	269.9	270.5	269.7	270.0	269.6	270.3	271.3	271.5
6	269.0	269.4	268.0	269.9	270.5	269.7	269.7	269.6	270.1	271.4	271.3
7	269.6	268.0	269.0	270.0	270.2	269.8	270.0	269.5	269.9	271.0	271.3
8	269.5	268.5	268.7	270.2	270.3	269.8	269.8	269.6	269.9	271.3	271.3
9	269.0	268.9	268.9	270.0	270.2	269.7	270.0	269.5	269.9	271.0	271.3
10	268.6	268.7	268.5	270.0	270.1	269.8	269.6	269.4	270.4	271.3	271.1
11	269.5	268.8	268.7	269.9	270.2	270.0	269.7	269.5	270.7	271.6	271.7
12	269.2	269.0	268.8	269.9	270.1	269.7	269.8	269.5	270.8	272.5	271.9
13	269.4	269.1	268.7	270.4	270.0	269.7	269.4	269.5	270.8	272.4	271.9
14	269.0	268.8	268.7	270.7	270.0	269.8	269.7	269.3	270.8	272.4	272.0
15	269.7	268.0	269.0	270.5	270.1	270.1	269.5	270.3	270.8	272.4	272.0
16	268.8	267.2	268.8	270.6	269.7	270.5	269.5	269.5	270.4	272.3	272.0
17	269.4	268.8	268.7	270.7	270.0	270.9	269.5	269.0	270.5	272.1	269.9
18	269.0	269.0	268.6	270.4	270.3	270.8	269.5	269.6	270.5	272.1	271.7
19	268.8	268.4	269.0	270.3	270.5	270.5	269.5	269.5	270.8	271.9	271.8
20	269.1	268.3	269.4	270.4	270.6	270.5	269.5	269.7	270.9	271.6	271.4
21	268.6	268.4	269.5	270.5	270.5	270.4	269.5	269.6	271.0	271.7	271.5
22	269.0	268.9	269.8	270.0	270.2	270.0	269.5	269.7	270.9	271.1	271.6
23	269.25	268.7	269.8	270.0	270.2	270.7	269.4	269.0	271.0	271.1	272.3
24	268.8	269.0	270.0	270.0	270.0	270.2	269.9	269.0	270.8	271.2	272.6
25	268.8	268.8	269.5	270.0	270.0	270.9	270.7	269.7	270.6	271.3	272.8
26	269.0	268.3	269.7	270.2	269.8	270.4	270.0	269.8	270.5	271.2	272.5
27	269.7	268.8	269.7	270.3	269.8	270.5	269.9	269.8	270.6	271.6	272.5
28	269.0	268.7	269.8	270.3	270.0	270.4	269.9	269.9	271.0	271.3	272.3
29	268.8	268.7	269.9	270.6	269.8	270.4	269.9	......	270.8	271.4	272.2
30	269.0	268.5	269.9	270.0	269.8	270.2	269.7	......	271.0	271.4	272.0
31	268.9	268.5	......	270.5	......	270.2	269.7	......	270.8	......	272.0

NOTE.—Station discontinued May 31, 1919.

OSWEGO RIVER, EAST SIDE, ABOVE CURVED DAM, OSWEGO

Gage No. 168

This gage was established December, 1907, as gage L of the Oswego specials. The gage was originally a reference point, elevation 275.56, located at the east end of the curved dam on the upstream face of the abutment about twenty-five feet from the end of the crest. On August 16, 1916, a standard Type A gage, No. 168, was erected at the south end of the upper east gate recess of lock No. 7. It has a range of 8 feet, between elevations 267.0 and 275.0. A standard bench-mark plug was set in the wall near the gage at elevation 275.0 (B. C. datum).

This gage should not be confused with the gage on the west side of the river, the record of which is published as "Oswego River above Curved Dam, Oswego."

The gage was read to tenths, with occasional readings to half-tenths, twice daily — at 6 A. M. and 6 P. M., July 1 to 6 and May 6 to June 30, and at 8 A. M. and 4 P. M., November 26 to May 5 — and four times daily — at 6 A. M., noon, 6 P. M. and midnight, July 7 to November 25. Read by A. E. Cheney, Fred Decker, Jos. W. Carroll and J. A. Donovan.

Daily elevation of water-surface (B. C. datum) of OSWEGO RIVER, EAST SIDE, ABOVE CURVED DAM, OSWEGO, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	270.00	269.52	269.12	269.89	270.71	269.80	270.25	269.30	270.00	270.15	271.50	272.00
2	269.80	269.30	268.82	270.25	270.74	269.85	270.00	270.00	269.60	270.40	271.85	271.90
3	269.60	269.35	269.12	270.84	270.88	269.85	270.15	269.95	270.35	270.40	271.85	271.70
4	269.40	269.10	269.20	270.18	271.18	269.70	270.10	269.75	270.30	271.05	271.70	271.20
5	269.75	269.32	269.08	270.22	270.75	269.50	270.05	269.65	270.30	271.25	271.35	270.20
6	269.60	269.35	267.48	270.18	270.62	269.68	270.20	269.70	270.20	271.40	271.40	270.10
7	269.55	269.30	269.05	270.45	270.78	269.60	270.05	269.70	270.00	271.30	271.30	270.65
8	269.62	269.22	269.30	269.98	270.40	269.82	269.90	269.70	269.85	271.30	271.30	270.75
9	269.12	269.30	268.90	270.29	270.40	269.85	269.90	269.25	269.85	271.20	271.15	270.60
10	269.02	269.28	269.12	270.38	270.55	269.50	269.70	269.75	270.45	271.30	271.10	270.45
11	269.25	268.88	269.20	270.35	270.40	269.80	269.75	269.65	270.80	271.55	271.95	270.20
12	269.42	269.40	269.20	270.31	270.15	269.75	269.60	269.45	270.90	272.15	272.10	270.30
13	269.58	269.28	269.12	270.80	270.04	269.65	269.90	269.35	270.75	272.60	272.00	270.95
14	269.52	269.28	269.18	270.72	270.08	269.80	269.80	269.40	270.60	272.60	272.15	270.50
15	269.92	269.35	269.25	270.60	269.72	269.98	269.80	270.10	270.60	272.45	272.15	270.80
16	269.58	269.22	269.08	270.50	269.98	270.45	269.75	269.70	270.20	272.20	271.80	270.35
17	269.45	268.85	269.32	270.82	270.34	270.20	269.60	269.80	270.60	272.10	271.45	270.45
18	269.38	269.05	269.50	270.12	270.60	270.65	269.70	269.75	270.60	272.00	271.85	270.35
19	269.35	269.05	269.45	270.12	270.72	270.30	269.70	269.55	270.90	271.85	271.75	270.40
20	269.20	269.18	269.70	270.15	270.65	270.45	269.90	269.50	271.10	271.65	271.55	270.00
21	269.22	269.20	269.78	270.15	270.52	270.45	269.85	269.40	271.10	271.35	271.75	269.80
22	269.75	269.05	270.15	270.08	270.40	270.40	269.65	269.60	271.10	271.20	271.65	269.85
23	269.75	269.12	270.02	270.15	270.32	270.38	269.70	269.05	271.10	271.20	272.25	269.80
24	269.15	269.22	269.85	270.01	270.64	270.45	269.60	269.60	270.40	271.35	272.70	269.70
25	269.42	269.02	269.81	270.00	270.32	270.40	270.05	269.85	270.70	271.15	272.70	269.55
26	269.45	269.02	270.18	270.18	269.80	270.[illegible]	[illegible].20	269.75	270.65	271.10	272.65	269.55
27	269.62	268.50	269.75	270.58	269.7[illegible]	[illegible]2	269.90	269.90	270.70	271.50	272.55	269.50
28	269.30	268.05	270.05	270.62	269.8[illegible]	[illegible].65	270.10	269.80	270.50	271.55	272.40	269.65
29	269.38	268.95	270.35	270.45	269.90	270.40	270.00	......	270.60	271.40	272.25	269.70
30	269.55	268.58	270.30	270.20	269.90	270.15	270.00	......	270.30	271.70	272.10	269.85
31	269.55	268.72	......	270.45	......	270.25	269.90	......	267.65	......	272.10	......

OSWEGO RIVER, BELOW LOCK No. 8, OSWEGO

Gage No. 166

This gaging station is located at the mouth of the Oswego river in the harbor at Oswego and indicates very closely the lake level, except during times of large flow in the Oswego river, when there will be some slight slope below the gage. It was established December, 1907, and was located on the east side of the river below Bridge street bridge, the bridge nearest the lake. The lower gage

in new lock No. 8 was used until August 11, 1916. On August 11, 1916, a standard Type A gage, No. 166, was erected on the end of lower east approach wall to lock No. 8. It has a range of 4 feet, between elevations 247.0 and 251.0. A standard bench-mark plug was set in the wall near the gage at elevation 249.05 (B. C. datum).

This gage was read to half-tenths four times daily, July 1 to December 7, and twice daily, December 8 to June 30. Read by Peter Langan, Frank Pearson and Herbert Penfield.

Daily elevation of water-surface (B. C. datum) of Oswego River below Lock No. 8, Oswego, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	248.01	247.80	247.40	247.18	247.14	247.02	247.20	247.20	247.00	247.55	248.00	249.10
2.....	248.01	247.76	247.20	247.11	247.22	246.92	247.00	247.05	246.85	247.50	248.25	249.20
3.....	248.00	247.66	247.28	247.20	247.02	246.96	247.00	247.00	246.98	247.45	248.10	249.15
4.....	248.04	247.62	247.26	247.24	247.12	247.04	247.05	247.10	246.80	247.45	248.05	249.10
5.....	248.05	247.62	247.35	247.22	247.12	247.01	247.00	247.00	247.10	247.45	248.00	249.00
6.....	247.96	247.52	247.35	247.22	247.80	246.92	247.00	247.05	247.05	247.50	248.30	249.00
7.....	248.04	247.70	247.32	247.16	247.02	246.90	246.95	247.05	246.95	247.50	248.30	249.05
8.....	247.99	247.58	247.44	247.05	247.00	247.00	247.00	247.05	246.85	247.50	248.40	249.00
9.....	247.58	247.55	247.11	247.08	247.00	246.95	247.15	246.95	246.72	247.55	248.35	249.10
10.....	247.50	247.56	247.25	247.05	247.08	246.85	247.30	246.90	247.10	247.45	248.30	249.10
11.....	247.55	247.46	247.25	247.10	247.00	246.82	247.28	246.90	247.15	247.50	248.45	249.10
12.....	248.01	247.65	247.12	247.10	247.02	246.88	247.05	247.00	247.15	247.85	248.50	249.10
13.....	248.00	247.64	247.20	247.14	247.00	246.85	247.20	247.00	247.15	247.90	248.60	249.10
14.....	247.99	247.62	247.18	247.21	247.09	246.90	247.10	247.00	247.00	247.90	248.60	249.10
15.....	247.98	247.62	247.10	247.20	247.00	246.85	247.05	247.00	246.82	247.85	248.60	249.10
16.....	247.96	247.64	247.16	247.20	246.98	247.00	247.00	247.00	246.85	247.65	248.60	249.05
17.....	247.98	247.68	247.32	247.11	246.95	247.00	247.10	247.00	246.92	247.90	248.60	249.10
18.....	247.89	247.60	247.32	247.11	246.95	246.95	247.00	247.10	247.30	248.10	248.70	249.05
19.....	247.86	247.51	247.16	246.95	247.11	246.95	247.30	247.05	247.30	248.00	248.70	249.00
20.....	247.83	247.48	247.16	247.10	247.19	247.00	246.95	247.10	247.35	248.00	248.55	249.05
21.....	247.88	247.36	247.28	247.16	247.19	246.90	247.00	246.95	247.35	248.05	248.80	249.05
22.....	247.81	247.44	247.36	247.02	247.20	246.85	247.00	246.80	247.42	248.00	248.95	249.05
23.....	247.86	247.38	247.20	247.02	247.21	247.00	246.95	246.95	247.38	248.00	249.05	249.00
24.....	247.78	247.40	247.25	246.98	247.15	246.90	247.40	247.05	247.45	248.15	249.05	248.95
25.....	247.80	247.41	247.26	246.98	247.22	247.00	247.20	246.70	247.45	248.10	249.10	248.90
26.....	247.88	247.40	247.29	247.00	247.09	247.25	246.95	247.18	247.28	248.15	249.15	248.95
27.....	247.81	247.34	247.35	247.00	247.02	247.20	247.20	246.88	247.60	248.00	249.30	249.05
28.....	247.74	247.22	247.15	247.00	246.98	247.20	247.00	246.75	247.90	248.10	249.20	249.00
29.....	247.66	247.35	247.16	247.05	247.02	247.00	247.12	......	247.85	248.20	249.20	248.95
30.....	247.72	247.40	247.16	247.00	247.02	247.20	247.00	......	247.40	248.20	249.05	248.95
31.....	247.77	247.38	......	247.12	......	247.05	247.20	......	247.50	......	249.15	......

SENECA RIVER BASIN

DESCRIPTION

Seneca river receives the drainage from the central group of lakes lying southward from Lake Ontario, known as the finger lakes. The drainage basin is rolling, though not precipitous, ex-

cepting for the deep narrow valleys crossing it, in which the lakes are situated, and certain additional valleys not at the present time occupied by lakes. All of the lakes properly belonging to the finger lake system do not drain into the Seneca river. Oneida lake on the east is tributary to Oneida river, while on the west of the Seneca river there is a series of lakes, including Honeoye, Canadice, Hemlock and Conesus lakes, smaller than, but parallel with and otherwise similar to the main finger lakes, which are tributary to Genesee river. The upper lakes of the system in the Seneca river basin are Onondaga, Otisco, Skaneateles, Owasco, Cayuga, Seneca, Keuka and Canandaigua lakes.

For table of drainage areas see page 74.

SENECA RIVER

DESCRIPTION

The stream designated as Seneca river originates at the outlet of Seneca lake, flows easterly into the foot of Cayuga lake and then northerly through the extensive Montezuma marshes to a point near Savannah, where it leaves the broad marsh area and turns easterly, passing to the north of Syracuse and receiving Onondaga outlet, then turning northerly and joining Oneida river at Three River Point to form the Oswego river. This river has been canalized for the Barge canal throughout its entire length. The construction of five dams and the necessary dredging has resulted in a series of navigable pools having low navigable water-surfaces referred to Barge canal datum as follows:

Above Three River Point due to the dam at Phoenix on the Oswego river, Elev. 363.0; above Baldwinsville, Elev. 374.0; above foot of Cayuga lake, Elev. 381.5; above Seneca Falls, Elev. 430.5; above Waterloo, Elev. 445.0.

The most important tributaries of Seneca river are the outlets of Onondaga, Otisco, Skaneateles and Owasco lakes, and Clyde river, which enters the Seneca river near Clyde and which in turn is formed by the junction of Ganargua creek, often called Mud creek, and Canandaigua outlet at Lyons.

The following tables show the daily elevation of water-surface at different gages maintained on Seneca river during the year

ended June 30, 1919, exclusive of those on Seneca and Cayuga lakes, which are given separately.

SENECA RIVER ABOVE LOCK No. 4, WATERLOO

Gage No. 251

This station is located above the new Barge canal lock No. 4, in the village of Waterloo. The new dam, or regulating works, consisting of six Taintor gates, each having a clear span of 36 feet, three with sills at elevation 439.0 and three at elevation 435.0, is located immediately below and replaces the old fixed dam. The three larger openings can pass water only to the power-plant of the Tracy Development Company. The low navigable surface above this dam is elevation 445.0.

The concrete staff gage in the upper end of the lock was read twice daily — at 8 A. M. and 4 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER ABOVE LOCK No. 4, WATERLOO, for the year ended June 30, 1919. B. R. McNair and Geo. F. Stone, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	446.3	445.35	444.9	444.4	444.2	444.2	444.1	443.7	443.1	443.8	445.0	447.2
2	446.1	445.7	444.9	444.45	444.25	444.05	443.95	443.6	443.2	443.75	445.0	447.15
3	446.25	445.5	444.55	444.5	444.3	444.1	443.95	443.4	443.05	443.9	445.2	447.15
4	446.45	445.75	444.4	444.4	444.25	443.9	444.0	443.45	443.1	443.9	445.1	447.05
5	446.3	445.25	444.1	444.5	444.2	443.9	444.15	443.6	443.0	443.95	445.25	447.1
6	446.35	445.2	444.15	444.55	444.2	444.0	443.95	443.4	443.1	444.1	445.1	447.1
7	446.3	445.35	444.3	444.5	444.2	443.95	443.95	443.5	443.0	443.9	445.25	447.25
8	446.15	445.4	444.55	444.4	444.3	444.1	443.9	443.5	443.2	444.0	445.05	447.15
9	445.85	445.4	444.3	444.55	444.1	443.8	443.85	443.5	443.15	444.0	445.4	447.2
10	445.95	445.45	444.0	444.5	444.25	443.75	443.95	443.25	443.25	444.1	445.35	447.1
11	445.9	445.6	444.15	444.4	444.25	443.95	443.9	443.35	443.3	444.45	445.75	447.0
12	446.05	445.45	444.2	444.45	444.05	443.85	443.9	443.45	443.35	444.5	445.75	446.95
13	446.0	445.35	444.05	444.5	444.1	443.95	443.75	443.3	443.35	444.6	445.9	446.9
14	446.2	445.1	444.35	444.35	444.0	444.05	443.75	443.2	443.4	444.75	446.1	446.95
15	445.95	445.3	444.45	444.35	444.05	444.1	443.85	443.3	443.5	444.7	446.1	446.85
16	445.95	445.1	444.15	444.3	444.05	443.95	443.75	443.4	443.6	444.8	446.1	446.9
17	446.0	445.4	444.15	444.3	444.2	443.95	443.8	443.3	443.5	444.75	446.2	446.95
18	445.75	445.45	444.3	444.2	444.35	443.9	443.9	443.3	443.55	444.85	446.35	446.75
19	445.7	445.15	444.25	444.25	444.3	443.9	443.9	443.2	443.55	444.65	446.0	446.9
20	445.9	445.0	444.15	444.4	444.35	443.9	443.7	443.25	443.6	445.0	446.05	446.65
21	445.95	444.8	444.5	444.05	444.35	443.95	443.5	443.2	443.55	444.85	446.0	446.75
22	445.65	444.8	444.55	444.15	444.3	444.1	443.65	443.25	443.65	444.8	446.2	446.8
23	445.75	444.7	444.3	444.05	444.2	443.85	443.8	443.3	443.7	444.85	446.55	446.75
24	445.65	445.0	444.45	443.95	444.35	443.9	443.8	443.3	443.7	444.95	446.9	446.6
25	445.85	445.05	444.25	444.1	444.3	*a*	443.8	443.1	443.6	445.0	447.15	446.75
26	445.7	444.75	444.35	444.1	444.35	444.0	443.85	443.25	443.6	445.0	446.95	446.8
27	445.8	444.7	444.3	444.35	444.1	443.95	443.65	443.15	443.55	444.95	447.0	446.6
28	445.85	444.65	444.45	444.3	444.35	443.9	443.65	443.05	443.65	444.95	447.15	446.65
29	445.7	444.65	444.45	444.2	444.2	444.15	443.6	......	443.7	444.8	447.0	446.85
30	445.75	444.6	444.35	444.0	444.15	443.8	443.65	......	443.75	444.7	447.2	446.65
31	446.1	444.75	......	444.3	......	443.9	443.6	......	443.7	......	447.3	......

a No record.

SENECA RIVER BELOW LOCK No. 4, WATERLOO

Gage No. 252

This station is located just below the new Barge canal lock No. 4, in the village of Waterloo.

The concrete staff gage in the lower end of the lock is read. The water-surface indicated is that of the Seneca river about 2,000 feet above the gage formerly read below old lock No. 2 at the junction of the old canal and the river.

The gage was read twice daily — at 8 A. M. and 4 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER BELOW LOCK No. 4, WATERLOO, for the year ended June 30, 1919. B. R. McNair and Geo. F. Stone, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	431.05	431.55	429.8	429.4	430.0	429.45	429.5	429.8	429.95	429.85	429.75	430.25
2	430.95	431.25	429.95	429.55	430.1	429.8	429.7	430.75	430.45	429.6	430.0	430.45
3	431.05	431.4	429.9	429.6	430.0	429.85	429.55	429.8	430.15	429.8	429.8	430.3
4	431.0	430.7	429.85	429.55	430.05	429.6	429.8	429.6	429.9	429.65	429.6	430.35
5	431.2	431.1	430.0	429.6	429.85	429.6	429.65	429.75	429.7	430.0	429.7	430.1
6	431.2	431.2	429.85	430.6	429.8	429.8	429.65	429.7	430.0	429.5	429.9	430.8
7	430.85	431.15	429.85	430.95	429.55	429.5	429.75	429.65	429.9	429.6	430.3	430.7
8	431.15	431.1	429.8	430.8	429.6	429.95	429.65	429.75	430.1	429.65	429.45	431.25
9	430.9	430.95	429.85	430.9	429.45	429.75	429.95	429.6	429.9	430.1	429.95	430.8
10	431.2	431.0	430.0	431.0	429.7	429.85	429.65	429.7	430.2	430.35	430.25	430.6
11	431.35	431.3	429.85	430.95	429.7	429.65	430.1	429.75	430.0	431.1	431.0	431.1
12	431.4	430.9	429.85	430.75	429.75	429.7	430.05	429.8	430.1	429.85	430.4	431.2
13	430.95	431.05	429.75	430.4	429.95	429.8	429.8	429.65	430.0	430.05	429.9	431.45
14	431.15	431.0	429.9	430.5	430.0	429.95	429.65	429.65	430.05	430.05	430.0	431.1
15	430.75	431.05	429.75	430.45	429.75	430.25	429.6	429.4	430.05	429.75	430.05	431.05
16	431.0	430.45	430.0	430.65	430.1	429.6	429.6	424.0	429.5	430.0	429.6	430.85
17	430.6	428.05	430.5	430.2	429.7	429.9	429.7	429.6	430.4	430.25	430.1	429.75
18	431.1	426.05	429.7	429.95	430.35	429.5	429.85	429.85	430.0	430.25	429.7	431.25
19	430.9	423.9	430.2	429.5	429.85	429.85	430.3	429.7	429.95	430.0	429.7	430.8
20	431.0	429.15	430.85	429.7	429.9	430.0	429.75	429.8	429.75	429.6	429.8	431.9
21	430.95	429.65	430.85	430.1	429.75	429.65	429.7	429.75	429.75	429.65	429.95	430.85
22	430.95	429.9	430.55	429.75	430.1	429.75	429.75	429.7	429.6	429.75	430.65	430.6
23	431.15	429.8	430.55	429.5	429.95	429.9	429.6	429.7	429.9	430.0	430.8	430.9
24	431.3	429.2	430.55	430.2	429.95	429.8	429.75	429.65	430.0	430.55	430.55	430.2
25	430.65	429.45	430.2	429.75	430.0	*a*	429.75	429.85	430.0	430.35	429.35	430.9
26	431.15	429.85	430.05	430.2	429.9	429.95	429.8	429.8	429.95	430.35	430.65	430.75
27	431.05	430.05	429.95	430.05	429.95	430.1	429.55	429.85	429.75	430.8	430.0	431.0
28	431.1	429.65	430.25	430.8	429.65	429.85	429.8	429.75	429.75	430.5	430.3	430.35
29	431.45	429.75	430.05	431.25	429.95	429.9	429.6	......	429.65	430.05	430.1	430.45
30	431.15	429.8	429.7	430.05	429.6	429.55	429.55	......	429.35	429.55	430.2	431.15
31	431.25	429.7	......	429.85	......	429.95	429.6	......	429.75	......	430.6	......

a No reading.

SENECA RIVER ABOVE LOCK No. 3, SENECA FALLS

Gage No. 253

This station, established June 17, 1917, is located above the lock dam at Seneca Falls. This dam was built to maintain a low water-surface at elevation 430.5.

The concrete staff gage at the upper end of lock No. 3 is read twice daily — at 9 A. M. and 4 P. M. — to tenths. Read by J. D. Compson, C. H. Condon, E. F. Palmatier and M. L. Toombs.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER ABOVE LOCK No. 3, SENECA FALLS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	430.7	431.1	429.7	429.55	429.65	429.5	429.5	429.75	429.7	429.85	429.45	430.55
2	430.7	430.9	429.65	429.55	429.9	429.7	429.55	430.5	430.8	429.65	429.85	430.55
3	430.65	431.2	429.45	429.6	430.15	429.9	429.6	429.7	429.95	429.85	429.65	430.2
4	431.05	430.65	429.65	429.85	429.9	429.55	429.8	429.6	429.8	429.9	429.55	430.4
5	430.95	430.9	429.7	429.8	429.8	429.7	429.8	429.6	429.5	430.05	429.75	430.0
6	431.15	430.95	429.4	430.55	429.8	429.6	429.5	429.65	429.85	429.55	430.0	430.55
7	430.7	430.85	430.0	430.85	429.6	429.45	429.7	429.55	430.1	429.65	430.1	430.8
8	431.0	430.8	429.8	430.9	429.4	429.9	429.55	429.75	429.9	429.7	430.05	431.0
9	430.7	430.8	429.5	431.2	429.6	429.6	429.95	429.5	429.95	430.0	429.8	430.6
10	430.95	430.85	429.65	431.0	429.75	429.8	429.55	429.65	430.1	430.3	430.1	430.55
11	431.25	431.15	429.55	431.05	429.8	429.6	430.0	429.5	430.0	431.1	431.15	431.0
12	430.95	430.75	429.4	430.8	429.8	429.6	430.1	429.7	430.0	429.75	429.95	431.1
13	430.8	430.8	429.15	430.5	429.85	429.5	429.7	429.5	430.05	429.7	429.75	431.35
14	431.25	430.7	429.6	430.45	429.75	429.9	429.6	429.65	429.85	429.9	429.85	431.1
15	430.55	430.85	429.8	430.6	429.7	430.2	429.6	429.5	429.95	429.55	429.9	431.0
16	430.8	430.05	429.85	430.65	430.05	429.65	429.7	423.8	429.35	430.05	429.25	430.75
17	430.7	428.0	430.5	430.3	429.7	429.75	429.75	429.55	430.45	430.4	430.0	429.4
18	430.35	425.95	429.55	429.95	430.35	429.5	429.9	429.9	429.8	430.3	429.75	431.1
19	430.6	423.4	430.1	429.65	429.8	429.7	430.4	429.5	429.85	429.95	429.4	430.8
20	430.8	428.8	430.35	430.25	429.85	429.8	429.8	429.95	429.75	429.7	429.5	430.5
21	430.9	429.3	430.75	430.8	429.7	429.55	429.85	429.65	429.85	429.6	429.85	430.75
22	430.8	429.6	430.7	431.3	429.95	429.65	429.6	429.8	429.5	429.9	430.65	430.3
23	431.05	429.4	430.4	430.05	430.0	429.8	429.65	429.65	429.8	429.8	430.85	430.9
24	430.95	428.95	430.55	429.7	430.0	429.6	429.7	429.75	429.95	430.35	430.15	430.3
25	430.55	429.55	430.1	429.75	429.75	429.75	429.8	429.8	429.9	430.0	429.5	430.75
26	430.95	429.45	429.8	430.05	429.8	429.65	429.85	429.8	429.9	430.35	430.75	430.7
27	430.7	429.75	429.7	429.85	429.7	429.8	429.65	429.65	429.8	430.7	429.4	430.9
28	431.35	429.3	430.2	429.95	429.85	429.75	429.75	429.65	429.8	430.15	430.25	430.25
29	431.15	429.55	429.95	429.7	429.95	429.95	429.6	......	429.75	429.85	430.3	430.4
30	431.0	429.25	429.4	429.45	429.75	429.65	429.5	......	429.35	429.3	430.15	431.1
31	430.85	429.45	......	430.0	......	429.65	429.55	......	429.8	......	430.55	......

SENECA RIVER AT FREE BRIDGE

This station was established January 1, 1915, and is located at the highway bridge across the Seneca river on the highway leading east from Seneca Falls and about 5 miles distant therefrom, and about 1 mile north, or downstream from Barge canal lock No. 1 of the Cayuga and Seneca canal at the foot of Cayuga lake.

The gage is a direct-reading staff, read twice daily to tenths with occasional half-tenth readings.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER AT FREE BRIDGE' NEAR CAYUGA, for the year ended June 30, 1919. C. D. Martin, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	375.35	375.05	375.20	376.35	376.00	375.45	375.25	375.60	375.75	377.40	377.70	379.55
2	375.10	375.00	375.20	376.30	375.90	375.25	375.55	375.60	375.90	377.30	377.40	379.40
3	375.30	375.00	375.10	376.45	375.90	375.05	375.85	375.60	375.90	377.45	377.60	......
4	375.60	374.90	375.10	376.35	375.80	374.85	375.70	375.50	375.75	377.60	377.55	......
5	375.75	375.00	375.00	376.30	375.70	374.78	375.85	375.40	375.70	377.75	377.50	......
6	375.95	375.00	375.10	376.55	375.60	375.05	376.00	375.40	375.68	377.80	377.40	......
7	376.00	375.00	374.98	376.75	375.60	374.95	375.90	375.40	375.60	377.92	377.05	......
8	375.15	375.00	375.05	376.35	375.70	375.05	375.80	375.40	375.58	378.00	376.85	......
9	375.50	375.10	375.20	376.05	375.60	375.25	375.75	375.50	375.95	377.98	377.00	......
10	375.75	375.10	375.42	375.90	375.60	375.35	375.87	375.40	376.60	378.00	377.45	......
11	375.95	374.90	375.50	375.90	375.70	375.55	375.75	375.40	376.85	378.70	378.90	......
12	376.00	375.00	375.50	375.90	375.62	375.65	375.80	375.40	376.70	380.05	379.65	......
13	375.90	375.05	375.60	375.90	375.50	375.40	375.80	375.30	376.50	379.85	379.80	......
14	375.80	375.25	375.50	376.00	375.50	375.55	375.85	375.32	376.15	379.65	379.20	......
15	375.80	375.40	375.50	376.05	375.60	375.95	375.70	375.45	375.90	379.05	378.05	......
16	375.70	375.00	375.40	375.85	375.75	376.10	375.70	375.60	376.05	377.70	377.75	......
17	375.68	374.80	375.55	376.65	375.75	376.05	375.70	375.60	377.00	377.65	377.75	......
18	375.60	374.90	375.60	375.55	376.45	375.75	375.70	375.50	377.65	377.40	377.95	......
19	375.50	375.00	375.65	375.45	376.85	375.50	375.80	375.40	377.75	377.10	377.80	......
20	375.50	374.88	375.85	375.35	376.40	375.60	375.82	375.40	377.55	376.90	377.65	......
21	375.60	374.75	376.10	375.50	376.05	375.60	375.70	375.40	377.35	376.90	377.90	......
22	375.48	374.58	376.00	375.50	375.65	375.65	375.70	375.50	377.20	376.75	378.70	......
23	375.40	374.45	375.85	375.50	375.45	375.80	375.80	375.50	376.95	376.55	379.65	......
24	375.40	374.55	376.55	375.45	375.30	375.65	375.80	375.60	376.75	376.75	380.25	......
25	375.40	374.75	376.75	375.45	375.25	375.85	375.80	375.70	376.60	376.80	380.85	......
26	375.30	374.80	376.65	375.65	375.15	376.05	375.80	375.70	376.60	377.00	380.55	......
27	375.30	374.70	376.75	375.85	375.10	375.95	375.80	375.75	376.60	377.50	379.75	......
28	375.20	374.60	376.50	375.75	375.00	375.75	375.72	375.60	376.65	377.80	379.30	......
29	375.20	374.70	376.45	375.70	374.90	375.55	375.70	......	376.90	377.95	379.30	......
30	375.20	374.80	376.50	375.82	375.05	375.40	375.68	......	377.20	377.88	379.35	......
31	375.15	374.88	......	375.90	......	375.25	375.60	......	377.35	......	379.65	......

NOTE.— Station discontinued June 3, 1919.

SENECA RIVER ABOVE LOCK No. 1, NEAR CAYUGA

Gage No. 401

A new standard gage, No. 401, was established June 1, 1919, on the face of the west lock wall above the upper gates of lock No. 1 (Mud lock) on the Cayuga and Seneca canal, about two miles north of the village of Cayuga. The gage is built in the concrete and graduated to tenths of a foot. The range is 17.2 feet, between elevations 369.5 and 386.7 (B. C. datum). Eleva-

tion of pool is 381.5. The gage bench-mark is located at the upper end, lower east guide wall of the lock, at elevation 381.0 (B. C. datum).

Daily elevation of water-surface (B. C. datum) of SENECA RIVER ABOVE LOCK No. 1, NEAR CAYUGA, for the year ended June 30, 1919. Albion Morton, Observer

DAY	June	DAY	June	DAY	June
1	384.75	11	384.55	21	384.25
2	384.6	12	384.50	22	384.20
3	384.6	13	384.55	23	384.30
4	384.65	14	384.45	24	384.25
5	384.75	15	384.45	25	384.35
6	384.65	16	384.35	26	384.45
7	384.65	17	384.35	27	384.2
8	384.75	18	384.30	28	384.1
9	384.85	19	384.40	29	384.2
10	384.55	20	384.45	30	384.2

SENECA RIVER BELOW LOCK No. 1, NEAR CAYUGA

Gage No. 402

A new standard gage, No. 402, was established June 1, 1919, on the face of the west lock wall and just north of the lower gates of lock No. 1 (Mud lock), Cayuga and Seneca canal, about two miles north of the village of Cayuga. The gage is built in the lock and has a range of 22.6 feet, between elevations 362.0 and 384.6. The gage bench-mark, located on the back side of the lower buffer-beam section, is at elevation 381.00 (B. C. datum).

This gage replaces "Free Bridge."

Daily elevation of water-surface (B. C. datum) of SENECA RIVER BELOW LOCK No. 1, NEAR CAYUGA, for the year ended June 30, 1919. Albion Morton, Observer

DAY	June	DAY	June	DAY	June
1	379.60	11	378.6	21	375.75
2	378.80	12	378.15	22	375.95
3	377.20	13	377.85	23	376.0
4	376.55	14	377.75	24	375.92
5	376.10	15	377.65	25	375.95
6	376.30	16	377.6	26	375.82
7	377.0	17	377.55	27	376.1
8	377.25	18	377.05	27	376.3
9	378.05	19	376.2	29	376.15
10	378.65	20	375.95	30	376.0

SENECA RIVER AT MONTEZUMA

Gage No. 203

The gage for this station is now located at the R. S. & E. R. R. bridge near Montezuma. It was originally established, as a standard chain gage, on May 4, 1904, at the N. Y. C. R. R. bridge,

at Fox Ridge, near Savannah. During the summer of 1916 it was moved about 2¾ miles south, or upstream, to the Toll Road bridge and a standard Type A gage, No. 203, was placed on the north side of the boat-house, just below the bridge; readings were obtained from October 1, 1916, to May 31, 1919, inclusive. Transferred to the south end, east pier, of the R. S. & E. R. R. bridge, the gage has a range of 16 feet and is in two sections. The lower section, between elevations 370.0 and 378.0, is on the south wall and the upper section, between elevations 378.0 and 386.0, is on the east wall. Records date from June 1, 1919. The gage bench-mark, a square cut on the southwest corner of the bridge seat, east abutment, is at elevation 393.50 (B. C. datum).

The gage was read once daily to tenths.

Daily elevation of surface-water (B. C. datum) of SENECA RIVER AT MONTEZUMA, for the year ended June 30, 1919. William T. Tanner, Jr., and Harold Higgins, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	375.4	375.0	*a*	376.7	375.5	*a*	*a*	375.1	375.2	*a*	377.6	379.2
2......	375.2	374.9	374.5	376.2	375.7	375.2	375.3	*a*	*a*	*a*	377.2	378.7
3......	375.7	374.9	374.5	376.3	*a*	375.0	375.7	375.2	375.5	376.8	377.4	377.0
4......	376.0	*a*	374.5	376.2	375.7	374.6	375.6	375.1	375.3	377.0	*a*	376.4
5......	375.4	374.9	374.6	376.2	375.6	374.5	*a*	375.0	375.4	377.3	377.3	376.0
6......	375.6	374.9	374.8	*a*	375.6	374.5	375.6	375.0	375.2	*a*	377.1	376.1
7......	*a*	374.8	374.9	376.3	375.5	374.5	375.6	375.0	375.2	377.3	377.0	376.7
8......	375.5	374.9	*a*	376.1	375.4	*a*	375.5	375.0	375.1	377.5	376.7	377.0
9......	375.2	375.0	375.2	376.1	375.5	375.0	375.4	*a*	*a*	377.6	376.8	377.5
10......	375.5	374.9	375.3	376.1	*a*	375.0	375.4	375.1	376.1	377.5	376.9	378.3
11......	376.0	*a*	375.3	375.9	375.8	375.1	375.3	375.0	376.5	378.0	*a*	378.3
12......	375.9	375.1	375.3	375.9	375.9	375.1	*a*	*a*	376.3	379.6	*a*	378.0
13......	375.9	375.1	375.4	*a*	376.0	375.2	375.5	374.9	376.1	*a*	*a*	377.5
14......	*a*	374.8	375.4	375.8	375.9	375.4	375.4	375.0	375.8	379.0	379.1	377.5
15......	375.7	374.8	*a*	375.7	375.6	*a*	375.3	375.0	375.5	378.4	378.1	377.4
16......	375.7	374.7	375.5	375.7	375.8	375.9	375.3	*a*	*a*	377.9	377.8	377.4
17......	375.7	374.7	375.7	375.6	*a*	375.9	375.2	375.1	376.5	377.6	377.5	377.3
18......	375.6	*a*	375.7	375.4	376.1	375.4	375.3	375.1	*a*	377.3	*a*	377.1
19......	375.5	374.8	375.7	375.4	376.7	375.4	*a*	375.0	377.3	377.0	*a*	376.0
20......	375.3	374.8	375.8	*a*	376.1	375.4	375.4	375.0	377.1	*a*	*a*	375.8
21......	*a*	374.6	375.8	375.4	376.0	375.4	375.3	375.0	376.9	376.8	*a*	375.8
22......	375.9	374.5	*a*	375.4	376.0	*a*	375.3	*a*	376.7	376.7	378.4	375.8
23......	375.5	374.4	376.0	375.4	375.8	375.7	375.3	*a*	*a*	376.5	379.3	375.8
24......	375.4	374.3	376.4	375.3	*a*	375.5	375.4	375.2	376.4	376.5	379.8	375.7
25......	375.3	*a*	376.3	375.3	375.5	*a*	*a*	375.2	376.2	376.7	*a*	375.7
26......	375.4	374.4	376.4	375.4	375.0	*a*	*a*	375.2	376.2	*a*	380.3	375.7
27......	375.3	374.4	376.5	*a*	375.0	375.8	375.4	375.1	376.1	*a*	379.8	375.8
28......	*a*	374.5	376.5	375.4	374.7	375.7	375.3	875.1	376.2	377.7	379.0	376.0
29......	375.3	374.4	*a*	375.5	374.7	*a*	375.3	......	376.4	377.8	*a*	375.9
30......	375.3	374.6	*a*	375.7	374.7	375.3	375.3	......	*a*	377.8	*a*	375.9
31......	875.2	374.7	......	375.6	......	375.1	375.2	......	*a*	......	*a*	......

a No record.

NOTE.— Gage read at Toll Road bridge, July 1 to May 31; gage read at R & S. E. R. R. bridge, June 1 to 30.

SENECA RIVER AT MOSQUITO POINT

Gage No. 202

This station, established April 21, 1904, is located on the Seneca river at Mosquito Point highway bridge about 3 miles north of Port Byron village and just below the confluence of Owasco outlet and the Seneca river. The standard chain gage, located on the upstream side of the span adjacent to the left bank of Seneca river, was superseded on October 10, 1916, by a standard Type A gage. This gage, No. 202, is secured to the east end of the south abutment of Mosquito Point bridge and has a range of 16 feet, between elevations 371.0 and 387.0. The gage bench-mark is a brass pin in concrete, east end of east wing wall, south abutment of bridge over canal, and is at elevation 387.304 (B. C. datum). The gage is read once daily — at 9 A. M.— to tenths.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER AT MOSQUITO POINT BRIDGE, PORT BYRON, for the year ended June 30, 1919. William Prettie, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	375.8	375.0	374.8	375.9	375.7	375.0	375.0	375.0	375.0	376.5	377.3	378.7
2......	375.0	374.9	375.0	375.9	375.6	375.3	375.2	375.0	375.3	376.5	377.0	378.5
3......	375.4	374.8	374.9	375.9	375.6	374.9	375.6	375.0	375.4	376.5	377.1	377.0
4......	375.6	374.8	374.8	375.9	375.6	374.6	375.6	374.9	375.2	376.8	377.2	376.3
5......	375.8	374.8	374.8	375.8	375.6	374.4	375.5	374.9	375.3	377.0	377.2	375.9
6......	375.8	374.8	374.8	376.0	375.5	374.5	375.5	374.9	375.1	377.0	377.0	375.6
7......	375.8	374.8	374.8	376.2	375.5	374.7	375.4	374.8	375.1	377.1	376.8	376.3
8......	375.4	374.7	374.7	376.0	375.5	374.7	375.3	374.8	375.0	377.2	376.6	376.6
9......	375.0	374.7	375.0	375.8	375.4	374.9	375.3	374.8	375.3	377.3	376.5	377.0
10......	375.3	374.8	374.9	375.7	375.4	375.0	375.2	374.9	375.9	377.3	376.6	377.6
11......	375.7	374.9	375.0	375.6	375.4	374.8	375.2	374.9	376.3	377.5	377.7	377.8
12......	375.8	374.9	375.2	375.6	375.4	374.9	375.3	374.8	376.2	378.9	378.7	377.6
13......	375.8	374.9	375.3	375.5	375.3	375.0	375.3	374.8	375.9	379.4	379.0	377.3
14......	375.7	374.8	375.1	375.7	375.3	375.3	375.2	374.9	375.6	378.8	378.8	377.1
15......	375.6	374.7	375.2	375.6	375.3	375.6	375.2	374.9	375.3	378.1	378.0	377.0
16......	375.6	374.6	375.2	375.5	375.3	375.8	375.2	375.0	375.5	377.7	377.5	377.0
17......	375.5	374.6	375.3	375.3	375.4	375.7	375.2	375.0	376.1	377.4	377.2	377.1
18......	375.5	374.6	375.3	375.2	375.9	375.5	375.1	375.0	376.7	377.1	377.5	376.8
19......	375.3	374.7	375.4	375.2	376.4	375.3	375.2	374.9	377.0	376.8	377.5	376.1
20......	375.3	374.7	375.4	375.2	375.9	375.3	375.2	374.8	376.9	376.6	377.3	375.7
21......	375.4	374.6	375.7	375.3	375.7	375.3	375.2	374.8	376.7	376.6	377.3	375.5
22......	375.6	374.4	375.7	375.3	375.5	375.2	375.2	374.9	375.5	376.5	377.7	375.6
23......	375.4	374.3	375.6	375.2	375.4	375.5	375.1	375.0	375.3	376.3	378.7	375.7
24......	375.3	374.3	375.4	375.2	375.3	375.3	375.1	375.1	376.1	376.3	379.2	375.6
25......	375.4	374.4	375.4	375.1	375.3	375.6	375.3	375.1	376.0	376.5	379.7	375.6
26......	375.3	374.6	376.0	375.3	375.1	375.8	375.3	375.1	376.0	376.5	379.7	375.5
27......	375.2	374.6	376.1	375.6	375.0	375.7	375.3	375.1	375.9	376.9	379.4	375.5
28......	375.2	374.5	376.1	375.7	374.9	375.5	375.2	375.1	376.0	377.3	378.7	375.8
29......	375.3	374.5	376.1	375.5	374.8	375.5	375.2	......	376.1	377.5	378.4	375.8
30......	375.2	374.5	376.1	375.5	374.8	375.2	375.2	......	376.4	377.5	378.5	375.7
31......	375.0	374.5	......	375.6	......	375.0	375.1	......	376.5	......	378.7	......

SENECA RIVER AT CROSS LAKE

Gage No. 201

This station, established May 1, 1904, is located at the highway bridge across the Seneca river about 1 mile above the entrance

of the Seneca river into Cross lake and about 3 miles northwest of the village of Jordan. The gage, a staff, on a boat-house on the east, or right bank of the river just above the bridge, was superseded on November 13, 1916, by a standard chain gage, No. 201, placed on top of east railing of south span of Jordan highway bridge, above Cross lake, having a range of 12 feet, between elevations 371.0 and 383.0. The gage bench-mark is the northwest corner of concrete well slab in front of hotel on east side of river and is at elevation 393.62 (B. C. datum).

The gage is read twice daily — at 7 A. M. and 2 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER AT CROSS LAKE, JORDAN, for the year ended June 30, 1919. M. Quimby, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	375.2	374.65	374.8	375.7	375.6	375.05	374.9	374.9	375.05	376.3	376.85	377.95
2	374.95	374.7	375.0	375.65	375.5	375.15	375.15	374.9	375.2	376.3	376.7	377.75
3	375.25	374.7	375.0	375.65	375.5	374.85	375.4	374.9	375.2	376.25	376.8	376.65
4	375.45	374.6	374.8	375.6	375.5	374.6	375.5	374.95	375.1	376.45	376.8	376.05
5	375.65	374.65	374.8	375.65	375.5	374.6	375.45	374.9	375.1	376.7	376.7	375.65
6	375.6	374.7	374.7	375.85	375.35	374.6	375.2	374.8	375.0	376.75	376.6	375.55
7	375.6	374.7	374.7	376.1	375.3	374.7	375.2	374.9	374.9	376.8	376.5	375.9
8	375.25	374.7	374.8	375.8	375.4	374.7	375.2	374.9	375.0	376.8	376.25	376.3
9	375.0	374.75	374.9	375.7	375.4	374.9	375.1	374.9	375.2	376.9	376.2	376.65
10	375.15	374.7	375.0	375.6	375.4	374.9	375.1	374.9	375.85	376.95	376.35	377.05
11	375.45	374.8	374.95	375.4	375.3	374.9	375.0	374.8	376.1	377.25	377.3	377.2
12	375.6	374.8	375.0	375.4	375.3	374.85	375.0	374.7	375.95	378.25	378.1	377.05
13	375.6	374.7	375.1	375.5	375.2	375.1	375.1	374.7	375.75	378.65	378.3	376.85
14	375.55	374.7	375.1	375.5	375.2	375.2	375.1	374.8	375.45	378.2	378.15	376.7
15	375.35	374.55	375.1	375.4	375.1	375.45	375.0	374.9	375.2	377.6	377.6	376.7
16	375.3	374.4	375.1	375.3	375.2	375.7	375.0	375.0	375.25	377.15	377.1	376.6
17	375.3	374.5	375.2	375.3	375.3	375.75	375.0	375.0	375.8	377.0	376.9	376.7
18	375.3	374.55	375.2	375.2	375.8	375.4	375.1	374.9	376.35	376.75	377.1	376.45
19	375.2	374.7	375.2	375.2	376.1	375.2	375.1	374.8	376.6	376.55	377.15	375.85
20	375.2	374.6	375.4	375.2	375.85	375.2	375.15	374.8	376.55	376.4	376.85	375.55
21	375.2	374.45	375.6	375.25	375.6	375.2	375.1	374.8	376.4	376.35	376.85	375.4
22	375.35	374.2	375.6	375.1	375.5	375.25	375.1	374.85	376.25	376.25	377.35	375.45
23	375.2	374.2	375.4	375.1	375.3	375.4	375.1	375.05	376.1	376.15	378.15	375.5
24	375.1	374.2	375.3	375.15	375.2	375.3	375.2	375.1	375.95	376.1	378.45	375.4
25	375.0	374.4	375.2	375.05	375.2	375.55	375.2	375.0	375.85	376.15	378.85	375.35
26	375.05	374.5	375.65	375.25	375.1	375.6	375.2	375.0	375.8	376.35	378.85	375.4
27	375.0	374.5	375.95	375.4	374.9	375.5	375.2	375.0	375.7	376.65	378.6	375.45
28	375.1	374.4	375.9	375.55	374.8	375.4	375.1	375.0	375.75	376.95	378.05	375.6
29	375.1	374.5	375.9	375.4	374.9	375.35	375.1	......	375.85	377.05	377.7	375.6
30	374.95	374.4	375.8	375.3	374.75	375.2	375.1	......	376.1	377.05	377.8	375.5
31	374.8	374.55	......	375.45	......	375.05	375.05	......	376.2	......	377.85	......

SENECA RIVER AT JACK'S REEF

Gage No. 200

This station, established April 20, 1904, is located on the Seneca river about 2 miles downstream from Cross lake and about 1,700 feet below what is commonly known as State Ditch bridge

across the canal cut-off on the road leading from the village of Jack's Reef, near Memphis. The gage, a vertical staff fastened to a tree on the left bank of the stream, was superseded on November 13, 1916, by a standard chain gage, No. 200, placed at the center of the State Ditch bridge on top of north railing, and has a range of 12 feet, between elevations 371.0 and 383.0. The gage bench-mark is top of plug in concrete monument 150 feet west of gage at elevation 394.65 (B. C. datum).

The gage is read once daily — at 9 A. M.— to tenths.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER AT FOOT OF JACK'S REEF, MEMPHIS, for the year ended June 30, 1919. Wm. H. Burns, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	375.2	374.8	374.5	375.6	375.5	374.8	374.7	374.8	374.8	376.1	376.6	377.2
2	375.0	374.7	374.8	375.5	375.6	374.9	374.9	374.9	375.2	376.1	376.4	377.3
3	375.1	374.6	374.7	375.5	375.6	374.8	375.3	374.9	375.1	376.0	376.5	376.4
4	375.3	374.7	374.6	375.5	375.4	374.6	375.2	374.8	375.0	376.1	376.6	375.9
5	375.6	374.8	374.5	375.5	375.3	374.4	375.2	374.8	375.0	376.3	376.5	375.6
6	375.8	374.6	374.6	375.6	375.2	374.3	375.1	374.7	374.9	376.4	376.5	375.3
7	375.6	374.6	374.5	375.8	375.2	374.3	375.0	374.7	374.8	376.5	376.4	375.7
8	375.3	374.6	374.6	375.7	375.3	374.4	374.9	374.6	374.7	376.5	376.2	376.0
9	374.9	374.6	374.8	375.5	375.3	374.7	374.8	374.7	375.1	376.6	376.0	376.3
10	375.1	374.5	374.8	375.4	375.2	374.7	374.7	374.8	375.6	376.8	376.1	376.7
11	375.4	374.6	374.9	375.3	375.2	374.7	374.7	374.8	375.9	376.8	376.8	376.9
12	375.5	374.8	374.9	375.2	375.1	374.6	374.8	374.7	375.7	377.6	377.5	376.8
13	375.5	374.7	374.9	375.3	375.1	374.8	374.9	374.7	375.4	378.0	377.8	376.6
14	375.4	374.6	375.0	375.4	375.2	374.9	374.9	374.6	375.3	377.8	377.7	376.4
15	375.4	374.5	375.0	375.3	375.1	375.3	374.8	374.7	375.2	377.3	377.2	376.4
16	375.3	374.4	375.0	375.2	375.1	375.4	374.8	374.9	375.1	376.9	376.8	376.4
17	375.3	374.4	375.0	375.1	375.2	375.4	374.7	374.9	375.5	376.6	376.5	376.3
18	375.2	374.4	375.0	375.0	375.7	375.2	374.7	374.8	376.1	376.4	376.7	376.3
19	375.2	374.5	375.1	374.9	376.0	375.0	374.9	374.8	376.4	376.2	376.8	375.8
20	375.1	374.4	375.2	375.0	375.6	374.9	375.0	374.7	376.4	376.1	376.6	375.4
21	375.3	374.3	375.3	375.1	375.4	374.8	375.0	374.7	376.2	376.1	376.5	375.2
22	375.2	374.2	375.3	375.1	375.3	375.0	374.9	374.7	376.0	376.0	377.6	375.3
23	375.2	374.1	375.4	375.0	375.2	375.2	374.9	374.8	375.9	376.0	377.8	375.4
24	375.1	374.0	375.2	375.0	375.0	375.2	375.0	374.9	375.7	375.9	377.9	375.3
25	375.0	374.3	375.1	374.9	375.1	375.4	374.9	374.9	375.7	376.0	378.1	375.2
26	375.0	374.4	375.5	374.9	375.0	375.5	375.1	374.9	375.6	376.1	378.2	375.2
27	374.9	374.3	375.7	375.0	374.9	375.4	375.1	374.8	375.6	376.3	378.1	375.1
28	375.0	374.2	375.7	375.1	374.8	375.3	375.0	374.8	375.5	376.6	377.6	375.2
29	375.1	374.4	375.7	375.2	374.8	375.0	374.9	......	375.7	376.8	377.5	375.3
30	375.0	374.3	375.7	375.2	374.7	374.8	374.9	......	375.8	376.7	377.3	375.4
31	374.9	374.2	......	375.4	......	374.7	374.9	......	376.0	......	377.2	......

SENECA RIVER ABOVE DAM, BALDWINSVILLE

Gage No. 199

This station, located above the dam in the Seneca river at Baldwinsville 12.5 miles above the confluence of the Seneca and Oneida rivers at Three River Point, was established November 12, 1898, by the United States Deep Waterways Survey, and is now maintained by this Department.

At Baldwinsville the old dam, crest elevation 372.28, has been raised in connection with the construction of the Barge canal by the addition of an ogee concrete crest having a total length of 352 feet at elevation 374.0, and an automatic sluice-gate having a clear opening 50 feet wide designed to open as the water-surface above the dam rises, has replaced the necessary amount of old crest at the north end of the dam.

The gage, a staff located on the upper approach wall to lock No. 24, was replaced on August 26, 1916, by a standard Type B gage, No. 199, secured to the west end of the north retaining wall above lock No. 24, and having a range of 12 feet, between elevations 369.0 and 381.0. A standard bench-mark plug was set in the face of the wall near the gage at elevation 378.0 (B. C. datum).

The gage is read twice daily — at 8 A. M. and 4 P. M.— to half-tenths.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER ABOVE DAM AT BALDWINSVILLE, for the year ended June 30, 1919. H. C. Fay, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	374.88	374.55	374.55	375.15	375.00	374.78	374.70	374.60	374.80	375.58	375.88	376.30
2	374.70	374.40	374.58	375.15	375.02	374.75	374.78	374.65	374.90	375.52	375.88	376.15
3	374.75	374.32	374.52	375.15	375.12	374.52	374.82	374.58	374.82	375.55	375.95	375.65
4	375.22	374.52	374.35	375.12	375.00	374.28	375.18	374.58	374.70	375.68	376.00	375.45
5	375.28	374.52	374.32	375.15	374.92	374.20	375.98	374.60	374.72	375.82	375.82	375.18
6	375.28	374.52	374.35	375.42	374.85	374.20	374.78	374.55	374.58	375.95	375.75	375.02
7	375.30	374.40	374.35	375.35	374.92	374.25	374.72	374.50	374.55	375.90	375.72	375.35
8	374.95	374.35	374.45	375.20	374.98	374.45	374.70	374.45	374.58	375.90	375.55	375.62
9	374.70	374.38	374.55	375.08	374.95	374.58	374.60	374.50	374.85	375.90	375.58	375.78
10	374.88	374.40	374.50	375.00	375.08	374.48	374.50	374.42	375.22	375.95	375.60	376.02
11	375.02	374.65	374.58	374.95	374.92	374.50	374.50	374.32	375.38	376.05	376.20	376.12
12	375.15	374.52	374.68	374.95	374.82	374.48	374.60	374.38	375.30	376.75	376.62	376.05
13	375.15	374.42	374.68	375.10	374.85	374.72	374.58	374.32	375.00	376.85	376.72	375.88
14	375.15	374.32	374.62	375.02	374.85	374.75	374.58	374.32	374.80	376.50	376.62	375.85
15	375.08	374.25	374.80	374.90	374.80	375.15	374.65	374.45	374.72	376.20	376.35	375.80
16	375.00	374.22	374.72	374.95	374.85	375.15	374.62	374.80	374.82	375.95	376.05	375.75
17	375.00	374.20	374.75	374.80	375.02	375.08	374.60	374.62	375.15	375.85	375.95	375.80
18	374.95	374.35	374.72	374.72	375.28	374.92	374.60	374.52	375.65	375.70	376.12	375.68
19	374.85	374.30	374.78	374.78	375.50	374.78	374.75	374.52	375.78	375.60	376.05	375.25
20	374.90	374.28	374.88	374.95	375.22	374.72	374.68	374.40	375.78	375.62	375.85	375.05
21	375.00	374.20	375.08	374.85	375,10	374.78	374.60	374.40	375.65	375.58	375.90	375.00
22	375.02	374.00	375.20	374.75	375.00	374.92	374.62	374.45	375.50	375.50	376.08	375.02
23	374.88	373.98	375.05	374.70	375.00	374.95	374.62	374.78	375.50	375.45	376.58	374.98
24	374.85	373.95	374.90	374.70	374.92	374.78	374.85	374.70	375.32	375.48	376.68	374.98
25	374.78	374.20	374.80	374.68	374.88	375.18	374.82	374.58	375.20	375.55	376.85	374.85
26	374.80	374.22	375.18	374.80	374.60	375.15	374.90	374.75	375.18	375.70	376.80	374.88
27	374.65	374.18	375.32	375.15	374.58	375.08	374.82	374.62	375.15	375.92	376.62	374.90
28	374.80	374.12	375.32	375.05	374.52	374.92	374.75	374.68	375.28	376.00	376.30	375.05
29	374.78	374.18	375.48	374.92	374.62	375.05	374.75	......	375.38	376.05	376.08	375.10
30	374.65	374.12	375.25	374.85	374.52	374.72	374.78	......	375.58	376.02	376.22	375.05
31	374.58	374.20	......	374.95	......	374.52	374.68	......	375.58	......	376.28	......

SENECA RIVER BELOW DAM, BALDWINSVILLE

Gage No. 198

This station, located below the dam in the Seneca river at Baldwinsville, was established November 12, 1898, by the United States Deep Waterways Survey and is now maintained by this Department. The gage, a staff located on the lower approach wall to lock No. 24, was replaced on July 25, 1916, by a standard Type A gage, No. 198, in two sections. The lower section is secured to the lower north approach wall, under the Syracuse street bridge, and has a range of 8 feet, between elevations 361.0 and 369.0. The upper section is secured to the north abutment of the Syracuse street bridge and has a range of 4 feet, between elevations 369.0 and 373.0. The gage bench-mark is a square chiseled mark on the northwest concrete stair railing, lock No. 24, and is at elevation 371.94 (B. C. datum).

The gage is read twice daily — at 8 A. M. and 4 P. M. — to half-tenths.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER BELOW DAM AT BALDWINSVILLE, for the year ended June 30, 1919. H. C. Fay, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	364.00	363.92	363.35	364.32	364.48	364.15	363.88	364.10	364.15	365.02	365.70	366.10
2.....	363.70	363.85	363.65	364.28	364.38	364.18	364.25	364.00	364.22	364.95	365.80	366.05
3.....	363.82	363.72	363.68	364.25	364.35	364.10	364.28	364.02	364.50	365.02	365.60	365.40
4.....	363.90	363.78	363.65	364.22	364.52	364.00	364.28	364.10	364.50	365.22	365.35	364.75
5.....	363.92	363.98	363.60	364.25	364.40	363.90	364.22	364.12	364.45	365.42	365.35	364.50
6.....	363.90	363.90	363.55	364.28	364.32	363.95	364.28	364.15	364 52	365.40	365.35	364.28
7.....	363.85	363.92	363.50	364.58	364.22	364.05	364.20	364.32	364.40	365.30	365.30	364.38
8.....	363.80	363.80	363.40	364.52	364.12	363.88	364.10	364.35	364.32	365.35	365.10	364.60
9.....	363.75	363.92	363.75	364.38	364.12	364.05	364.10	364.20	364.50	365.55	364.90	364.80
10.....	363.85	363.90	363.55	364.22	364.00	364.15	364.10	364.20	365.15	365.60	364.95	365.00
11.....	364.08	363.90	363.68	364.20	364.02	364.12	364.08	364.08	365.35	365.90	365.62	365.25
12.....	364.10	364.05	363.70	364.30	364.18	363.95	364.00	364.00	365.25	366.65	366.12	365.18
13.....	364.08	363.92	363.82	364.28	364.08	364.10	364.02	363.95	365.00	367.20	366.58	364.95
14.....	364.00	363.80	363.80	364.28	364.00	364.40	364.10	364.25	364.92	367.12	366.58	364.72
15.....	364.00	363.72	363.75	364.10	364.12	364.40	364.35	364.22	364.75	366.75	366.35	364.70
16.....	364.00	363.68	364.00	364.08	364.22	364.48	364.25	364.00	364.62	366.25	365.78	364.65
17.....	364.00	363.58	364.00	364.15	364.42	364.42	364.25	364.18	364.95	365.95	365.40	364.80
18.....	363.92	363.58	364.05	364.00	364.48	364.25	364.30	364.10	365.30	365.65	365.52	364.65
19.....	363.90	363.80	364.10	364.00	364.55	364.15	364.30	364.05	365.52	365.42	365.58	364.42
20.....	363.90	363.72	364.32	364.10	364.48	364.10	364.30	363.95	365.58	365.25	365.48	364.12
21.....	363.90	363.68	364.32	364.12	364.32	364.05	364.22	363.90	365.50	365.28	365.50	364.02
22.....	364.12	363.65	364.30	364.10	364.10	364.12	364.20	363.75	365.28	365.32	365.58	363.92
23.....	364.00	363.58	364.38	364.02	364.10	364.25	364.20	363.80	365.00	365.30	366.22	364.12
24.....	364.00	363.42	364.10	364.02	363.98	364.38	364.42	364.10	365.02	365.30	366.75	364.18
25.....	364.10	363.35	364.32	364.08	364.05	364.42	364.40	364.22	365.00	365.28	367.00	364.22
26.....	364.12	363.62	364.38	364.05	364.10	364.52	364.40	364.30	364.92	365.30	367.20	364.08
27.....	364.02	363.62	364.30	364.28	364.08	364.42	364.28	364.20	364.90	365.40	367.05	364.00
28.....	363.98	363.58	364.50	364.30	364.05	364.28	364.20	364.10	364.78	365.48	366.80	364.12
29.....	364.20	363.48	364.38	364.25	364.00	364.08	364.20	......	364.85	365.68	366.38	364.20
30.....	364.18	363.42	364.38	364.10	363.98	364.12	364.12	......	364.90	365.75	366.18	364.10
31.....	364.02	363.32	......	364.35	......	363.98	364.12	......	365.00	......	366.12	......

SENECA RIVER AT BELGIUM

Gage No. 196

This station is located at the highway bridge across the Seneca river at Belgium. It was established April 14, 1904. The staff gage, located on the docking on the right bank of the stream, a short distance above the highway bridge, was superseded in March, 1916, by a chain gage on the new bridge.

On October 17, 1917, a standard Type A gage, No. 196, was erected on the upstream face of the north abutment, having a range of 8 feet, between elevations 363.0 and 371.0. State bench-mark No. 56 is a copper plug in the door-sill of a brick building 50 feet north of the east abutment of the bridge, and is at elevation 370.368 (B. C. datum).

The gage is read once daily — A. M. — to hundredths.

Daily elevation of water-surface (B. C. datum) of SENECA RIVER AT BELGIUM, for the year ended June 30, 1919. A. R. Gates, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	363.86	363.88	363.30	364.11	364.26	363.79	363.84	363.99	364.12	364.75	365.20	365.14
2	363.66	363.80	363.65	364.08	364.19	364.11	364.12	363.91	364.23	364.70	365.40	365.10
3	363.68	363.71	363.59	364.05	364.22	363.98	364.16	363.94	364.40	364.66	365.10	364.89
4	363.86	363.71	363.60	364.02	364.33	363.91	364.14	364.10	364.38	364.80	364.94	364.39
5	363.84	363.95	363.52	364.06	364.22	363.80	364.00	364.50	364.38	365.50	364.85	364.30
6	363.80	363.85	363.51	364.14	364.15	363.90	364.11	364.10	364.40	364.93	364.94	364.10
7	363.80	363.80	363.44	364.29	364.09	363.97	363.97	364.26	364.30	364.88	364.90	364.12
8	363.71	363.75	363.40	364.26	364.01	363.86	363.98	364.31	364.25	364.86	364.80	364.30
9	363.64	363.80	363.69	364.16	364.02	364.00	363.98	364.15	364.27	365.80	364.60	364.39
10	363.74	363.81	363.58	364.06	363.93	364.05	363.97	364.80	364.88	365.60	364.79	364.44
11	363.90	363.85	363.58	363.95	363.92	364.05	363.91	363.99	365.30	365.20	365.60	364.65
12	363.96	364.10	363.56	364.02	364.06	363.86	364.25	363.94	364.95	365.73	365.20	364.56
13	363.91	363.89	363.72	364.21	363.92	363.95	364.39	363.86	364.85	366.14	365.60	364.40
14	363.91	363.76	363.69	364.11	363.81	364.28	364.35	364.15	364.72	366.20	365.65	364.24
15	363.91	363.70	363.70	363.96	364.00	364.33	364.26	364.14	364.63	365.94	365.45	364.23
16	363.87	363.60	363.90	364.01	364.14	364.29	364.17	364.30	364.50	365.60	365.11	364.21
17	363.90	363.58	363.91	364.01	364.11	364.26	364.11	364.70	364.69	365.34	364.90	364.29
18	363.82	363.55	363.90	363.92	364.32	364.15	364.00	364.00	364.92	365.14	364.98	364.38
19	363.82	363.71	363.98	363.93	364.28	364.05	364.11	363.94	365.17	364.95	364.95	364.19
20	363.81	363.69	364.16	363.92	364.27	363.99	364.15	363.84	365.22	364.90	365.00	363.91
21	363.80	363.60	364.21	363.99	364.11	364.01	364.90	363.78	365.16	364.81	364.95	363.93
22	364.50	363.59	364.21	363.99	363.95	364.04	364.50	363.74	364.99	365.50	364.94	363.83
23	363.90	363.56	364.29	363.99	364.01	364.05	364.50	363.74	364.84	365.50	365.33	363.95
24	363.92	363.45	364.16	363.98	363.95	364.21	364.33	364.60	364.75	365.40	365.61	364.90
25	363.99	363.34	364.11	363.98	363.85	364.34	364.26	364.15	364.80	365.00	365.88	364.00
26	364.00	363.55	364.20	364.10	363.88	364.32	364.20	364.21	364.70	365.10	365.94	363.90
27	363.99	363.50	364.24	364.18	363.97	364.26	364.16	364.16	364.71	365.10	365.94	363.82
28	363.95	363.50	364.32	364.15	363.90	364.10	364.14	364.50	364.63	364.97	365.78	363.95
29	364.10	363.45	364.25	364.11	363.86	364.00	364.12	......	364.66	365.16	365.48	364.60
30	364.00	363.32	364.21	364.05	363.82	363.93	364.70	......	364.72	365.22	365.25	363.91
31	363.98	363.29	......	364.25	......	363.90	364.30	......	364.75	......	365.18	......

KEUKA LAKE

DESCRIPTION

Keuka, or "Crooked," lake is one of the finger group of lakes in central New York. It lies west of the southerly part of Seneca lake, into which it drains. The lake is long and narrow, lying generally in a north and south direction, the northerly portion being divided into two approximately parallel branches. The shores of the lake rise rather abruptly from the water's edge. It has a total drainage area of 178.47 square miles, of which 17.51 square miles, or 9.8 per cent, is water-surface.

The lake is retained by a State dam in the outlet at Penn Yan. The outflow of the lake is practically controlled by the flow through two mills located at each end of the State dam, the water only occasionally flowing over the crest. This lake has a natural range of about 6 feet and according to occasional records of a gage maintained on the outlet about a fourth of a mile above the State dam by Mr. W. N. Wise of Penn Yan, the surface rose to 4 feet above the crest of the dam in April, 1870, and fell to 6 feet below the crest in December, 1899, giving an extreme range of 10 feet. The surface of the lake is at elevation about 715, Barge canal datum.

KEUKA LAKE AT PENN YAN

Gage No. 211

This station is located at Penn Yan at the foot of Keuka lake. It was established January 1, 1915, to determine lake level. The gage is located on the outlet about ¾ mile from the lake and above the State dam. It is a staff attached to a pile near the right bank about 100 feet above the upper bridge. The gage is read once daily — at 8 A. M. — to tenths. Gage heights only are published, as Barge canal levels have not as yet been extended to this locality. For earlier records in this vicinity see Keuka lake description.

Daily gage height, in feet, of KEUKA LAKE AT PENN YAN, for the year ended June 30 1919. E. F. Garbus, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	6.3	5.5	4.5	4.2	3.7	3.5	3.4	3.0	2.7	3.3	4.3
2	6.2	5.4	4.4	4.2	3.7	3.5	3.3	3.0	2.7	3.3	4.5
3	6.2	5.4	4.4	4.2	3.6	3.5	3.3	3.0	2.7	3.3	4.5
4	6.2	5.4	4.4	4.1	3.6	3.5	3.3	3.0	2.7	3.4	4.5
5	6.2	5.3	4.3	4.1	3.6	3.5	3.3	3.0	2.7	3.4	4.5
6	6.2	5.3	4.3	4.1	3.6	3.5	3.3	3.0	2.7	3.4	4.5
7	6.1	5.3	4.3	4.1	3.6	3.5	3.3	3.0	2.7	3.5	4.5
8	6.1	5.3	4.2	4.1	3.6	3.5	3.3	3.0	2.7	3.5	4.5
9	6.1	5.2	4.2	4.0	3.6	3.5	3.3	2.9	2.9	3.5	4.5
10	6.1	5.2	4.2	4.0	3.5	3.4	3.2	2.9	2.9	3.6	4.7
11	6.0	5.2	4.1	4.0	3.5	3.4	3.2	2.9	2.9	3.8	5.3
12	6.0	5.1	4.1	4.0	3.5	3.4	3.2	2.9	2.9	4.0	5.4
13	6.0	5.1	4.1	3.9	3.5	3.4	3.2	2.9	2.9	4.0	5.5
14	6.0	5.1	4.1	3.9	3.5	3.4	3.2	2.9	2.9	4.1	5.6
15	5.9	5.0	4.1	3.9	3.4	3.4	3.2	2.9	2.9	4.1	5.6
16	5.9	5.0	4.1	3.9	3.4	3.4	3.2	2.8	2.9	4.1	5.6
17	5.9	5.0	4.1	3.8	3.4	3.3	3.1	2.8	3.1	4.1	5.7
18	5.8	4.9	4.1	3.8	3.7	3.3	3.1	2.8	3.2	4.1	5.7
19	5.8	4.9	4.1	3.8	3.7	3.3	3.1	2.8	3.2	4.1	5.7
20	5.8	4.9	4.3	3.8	3.7	3.3	3.1	2.8	3.2	4.1	5.7
21	5.8	4.8	4.3	3.7	3.7	3.3	3.1	2.8	3.2	4.1	6.0
22	5.8	4.8	4.3	3.7	3.7	3.3	3.1	2.8	3.2	4.1	6.3
23	5.7	4.8	4.3	3.7	3.7	3.3	3.1	2.8	3.2	4.2	6.7
24	5.7	4.7	4.3	3.7	3.6	3.3	3.1	2.8	3.2	4.2	7.0
25	5.7	4.7	4.3	3.6	3.6	3.3	3.1	2.8	3.2	4.2	7.2
26	5.6	4.7	4.3	3.6	3.6	3.3	3.0	2.8	3.2	4.3	7.2
27	5.6	4.6	4.3	3.6	3.6	3.3	3.0	2.7	3.3	4.3	7.2
28	5.6	4.6	4.3	3.6	3.6	3.3	3.0	2.7	3.3	4.3	7.2
29	5.6	4.6	4.2	3.6	3.6	3.4	3.0	......	3.3	4.3	7.2
30	5.5	4.5	4.2	3.7	3.6	3.4	3.0	......	3.3	4.3	7.2
31	5.5	4.5	......	3.7	......	3.4	3.0	......	3.3	......	7.2

NOTE.— This station discontinued May 31, 1919.

SENECA LAKE

DESCRIPTION

Seneca lake, the largest and deepest of the finger group lakes of central New York, has a length of about 34.4 miles and a width varying from 1 to 3 miles. The area draining directly into Seneca lake, exclusive of Keuka lake above its outlet, is 529.62 square miles, of which 67.16 square miles, or 12.7 per cent, is water-surface. The total drainage above the outlet at Seneca lake, including Keuka lake, is 708.09 square miles, of which 84.67 square miles, or 12 per cent, is water-surface.

This lake has the usual alluvial fan at its south end which is characteristic of these glacial lakes.

Records of water-surface fluctuations are available, as follows:

Two records in 1841 and at varying intervals from June, 1844, to December, 1846, referred to the bottom of the Geneva level, are found in the testimony of O. W. Childs, Esq., Chief Engineer, in publication entitled "Canal Frauds," Assembly document No. 100 (New York State), February 17, 1847, pp. 264–5.

1891 and 1910, inclusive, records at varying intervals of a gage maintained by Mr. Chas. W. Ingalls at Watkins.

1900–1905, inclusive, observations at irregular intervals will be found in the records of the City Engineer's office, Geneva.

March, 1901, to October, 1904, inclusive, observations made by the State Engineering Department during the construction of the regulating works in the outlet about 1,500 feet from the lake.

1907 to 1909, inclusive, weekly records taken at the Geneva pumping station on Wednesday nights.

August, 1909, to December, 1914, inclusive, records of the gage maintained by the State Engineer's Department above the guard-gate in outlet about 1,500 feet from the lake.

September 21, 1912, to June 30, 1919, at Watkins.

January 1, 1915, to June 30, 1919, at Geneva.

The discharge from and the surface of this lake is controlled by regulating works at Waterloo, about 5 miles from the lake, constructed in connection with the canalization of the Seneca river for the Barge canal. These works consist of six Taintor gates, each having a clear span of 36 feet.

For this lake certain water-surface elevations were assumed for use in the design of the Barge canal. These elevations, referred to Barge canal datum, are as follows: Average high water, elevation 447.0; canal pool, or low navigable stage, elevation 445.0; average low water, elevation 444.5. By average surface is meant the surface unaffected by wind.

SENECA LAKE AT WATKINS

Gage No. 209

This station, established September 21, 1912, is located at the head, or south end of Seneca lake. The gage was originally located at the Fourth street bridge over the canal. On January 1, 1915, a direct-reading staff was located on McAnarney's dock. On July 12, 1916, a standard Type A gage, No. 209, was erected on docking at end of boat slip back of Lembeck and Betz' malt house. It has a range of 8 feet, between elevations 442.0 and 450.0. The gage bench-mark is the top of concrete foundation, northeast corner of Lembeck and Betz' boiler room and is at elevation 453.465 (B. C. datum).

The gage is read once daily — at noon — to even hundredths.

Daily elevation of water-surface (B. C. datum) of SENECA LAKE AT WATKINS, for the year ended June 30, 1919. Fred Wright, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	446.76	446.10	445.34	444.80	444.50	444.50	444.30	443.88	443.48	444.18	445.40	447.44
2	446.74	446.08	445.30	444.80	444.50	444.50	444.30	443.88	443.48	444.20	445.40	447.44
3	446.72	446.06	445.26	444.80	444.50	444.48	444.30	443.88	443.48	444.22	445.40	447.44
4	446.70	446.04	445.22	444.80	444.50	444.46	444.30	443.86	443.48	444.24	445.50	447.44
5	446.68	446.02	445.18	444.78	444.50	444.44	444.30	443.84	443.48	444.26	445.60	447.44
6	446.66	446.00	445.14	444.76	444.50	444.42	444.30	443.82	443.48	444.30	445.60	447.44
7	446.64	445.98	445.10	444.74	444.50	444.40	444.28	443.80	443.48	444.40	445.60	447.44
8	446.62	445.96	445.06	444.72	444.50	444.40	444.26	443.78	443.48	444.50	445.60	447.44
9	446.60	445.94	445.02	444.70	444.50	444.40	444.24	443.78	443.50	444.60	445.60	447.44
10	446.58	445.92	444.98	444.70	444.50	444.38	444.22	443.78	443.52	444.70	445.74	447.44
11	446.56	445.90	444.94	444.70	444.50	444.36	444.20	443.78	443.54	444.80	446.00	447.42
12	446.54	445.88	444.90	444.70	444.50	444.34	444.18	443.76	443.56	444.90	446.20	447.40
13	446.52	445.86	444.86	444.70	444.50	444.32	444.17	443.74	443.58	444.98	446.30	447.34
14	446.50	445.84	444.82	444.70	444.50	444.30	444.16	443.72	443.60	445.00	446.34	447.30
15	446.48	445.82	444.78	444.70	444.50	444.30	444.14	443.70	443.62	445.02	446.34	447.28
16	446.46	445.80	444.74	444.70	444.50	444.30	444.12	443.68	443.70	445.04	446.38	447.24
17	446.44	445.78	444.70	444.70	444.50	444.30	444.12	443.66	443.80	445.10	446.40	447.22
18	446.42	445.76	444.70	444.70	444.50	444.30	444.12	443.64	443.90	445.14	446.50	447.20
19	446.40	445.74	444.70	444.70	444.50	444.30	444.12	443.62	443.98	445.20	446.51	447.18
20	446.38	445.72	444.90	444.68	444.50	444.30	444.12	443.60	444.00	445.20	446.51	447.14
21	446.36	445.70	444.90	444.66	444.50	444.30	444.10	443.58	444.00	445.20	446.51	447.12
22	446.30	445.68	444.80	444.64	444.50	444.30	444.08	443.56	444.00	445.20	446.70	447.10
23	446.28	445.64	444.80	444.62	444.50	444.30	444.06	443.54	444.00	445.20	447.00	447.08
24	446.26	445.62	444.80	444.60	444.50	444.30	444.04	443.52	444.00	445.20	447.10	447.06
25	446.24	445.58	444.80	444.58	444.50	444.30	444.02	443.50	444.00	445.20	447.30	447.04
26	446.22	445.54	444.80	444.56	444.50	444.30	444.00	443.48	444.00	445.20	447.30	447.00
27	446.20	445.50	444.80	444.54	444.50	444.30	443.98	443.48	444.00	445.30	447.40	447.00
28	446.18	445.46	444.80	444.52	444.50	444.30	443.96	443.48	444.04	445.36	447.44	447.00
29	446.16	445.42	444.80	444.50	444.50	444.30	443.94	......	444.08	445.40	447.44	447.00
30	446.14	445.40	444.80	444.50	444.50	444.30	443.92	......	444.10	445.40	447.44	447.00
31	446.12	445.38	......	444.50	......	444.30	443.90	......	444.10	......	447.44	......

SENECA LAKE AT GENEVA

Gage No. 208

This station was established January 1, 1915, and was originally located near Castle street in the old Cayuga and Seneca canal harbor, but on March 19, 1915, it was moved to the Cayuga and Seneca canal just north of Lake street. The staff gage formerly used was replaced on July 14, 1916, by a standard Type A gage. This gage, No. 208, is secured to the east harbor wall just above the Lake street bridge, and has a range of 8 feet, between elevations 442.0 and 450.0. A standard bench-mark plug is set in the face of the wall near the gage, at elevation 449.0 (B. C. datum).

This station replaces the station formerly maintained in the Seneca river above the guard-gate about 1,500 feet below the mouth of Seneca lake.

The gage is read once daily — at noon — to half-tenths and even hundredths.

Daily elevation of water-surface (B. C. datum) of SENECA LAKE AT GENEVA, for the year ended June 30, 1919. T. C. McNicholas, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	446.7	445.96	445.08	444.74	444.50	444.50	444.24	443.90	443.48	444.08	445.38	447.40
2......	446.6	445.96	445.10	444.82	444.52	444.38	444.38	443.88	443.50	444.18	445.38	447.40
3......	446.55	445.88	445.12	444.72	444.48	444.36	444.28	443.85	443.46	444.20	445.38	447.38
4......	446.68	445.88	445.02	444.75	444.48	444.32	444.34	443.84	443.50	444.22	445.34	447.35
5......	446.65	445.9	445.05	444.78	444.46	444.30	444.34	443.82	443.05	444.30	445.30	447.38
6......	446.6	445.84	444.95	444.80	444.44	444.28	444.30	443.80	443.40	444.30	445.28	447.35
7......	446.56	445.82	444.92	444.80	444.42	444.32	444.25	443.76	443.46	444.28	445.30	447.35
8......	446.5	445.76	444.88	444.76	444.44	444.30	444.25	443.74	443.52	444.28	445.32	447.38
9......	446.45	445.95	444.84	444.75	444.44	444.26	444.12	443.72	443.60	444.28	445.34	447.45
10......	446.42	445.90	444.80	444.72	444.42	444.20	444.20	443.70	443.60	444.38	445.65	447.38
11......	446.42	445.90	444.76	444.70	444.44	444.40	444.12	443.70	443.60	444.70	446.00	447.36
12......	446.45	445.85	444.78	444.72	444.44	444.36	444.10	443.72	443.56	444.80	446.12	447.34
13......	446.44	445.80	444.68	444.72	444.46	444.28	444.12	443.72	443.68	444.90	446.26	447.32
14......	446.42	445.80	444.65	444.78	444.42	444.20	444.10	443.72	443.65	445.00	446.30	447.28
15......	446.38	445.76	444.64	444.70	444.35	444.32	444.08	443.65	443.68	444.98	446.32	447.25
16......	446.36	445.68	444.62	444.60	444.45	444.36	444.06	443.62	443.90	445.00	446.34	447.22
17......	446.35	445.68	444.68	444.72	444.44	444.34	444.06	443.60	443.85	445.14	446.40	447.18
18......	446.32	445.62	444.68	444.55	444.52	444.30	444.06	443.60	443.85	445.10	446.46	447.08
19......	446.26	445.61	444.72	444.60	444.55	444.30	444.04	443.58	443.90	445.20	446.48	447.06
20......	446.22	445.56	444.78	444.68	444.46	444.28	444.04	443.56	443.86	445.20	446.42	447.05
21......	446.20	445.52	444.84	*a*	444.56	444.28	444.02	443.72	444.00	445.20	446.55	446.95
22......	446.18	445.42	444.80	*a*	444.52	444.36	444.02	443.76	444.00	445.20	446.72	447.00
23......	446.18	445.40	444.82	*a*	444.52	444.40	444.06	443.52	443.95	445.16	446.90	447.05
24......	446.15	445.38	444.82	*a*	444.54	444.36	443.96	443.45	443.90	445.18	447.08	447.08
25......	446.15	445.35	444.78	*a*	444.46	444.34	443.94	443.60	443.96	445.16	447.24	447.10
26......	446.15	445.32	444.80	*a*	444.44	444.30	443.95	443.46	443.98	445.18	447.30	447.10
27......	446.15	445.28	444.78	444.52	444.40	444.25	443.95	443.56	444.00	445.18	447.38	446.94
28......	446.18	445.40	444.75	444.56	444.50	444.30	443.94	443.54	444.00	445.22	447.35	446.94
29......	446.16	445.18	444.75	444.50	444.36	444.25	443.90	......	444.00	445.28	447.40	446.92
30......	446.04	445.12	444.80	444.48	444.38	444.22	443.94	......	444.00	445.30	447.38	446.96
31......	445.96	445.12	......	444.50	......	444.22	443.90	......	444.00	......	447.38	......

a No record.

CAYUGA LAKE

DESCRIPTION

Cayuga lake, the second in size of the finger lakes, in central New York, has a length of about 37½ miles and a width varying from 1 to 3 miles, and lies generally in a north and south direction. It has the usual abruptly rising shores and the alluvial fan at its head, or south end. The territory draining directly into this lake, exclusive of Seneca lake, has an area of 863.57 square miles, of which 66.31 square miles, or 7.7 per cent, is water-surface. The total drainage above the outlet of Cayuga lake, including Keuka and Seneca lakes, is 1,571.66 square miles, of which the total water-surface of the three lakes amounts to 150.98 square miles, or 9.6 per cent.

The southeast portion of this watershed, drained by Fall creek, lies south and east of a large portion of the Owasco lake drainage basin and extends almost to the southern end of Skaneateles lake.

Seneca river enters the foot of Cayuga lake from the west and leaves it near the east side at the new controlling works, about 2 miles north of Cayuga, built in connection with the Barge canal. These works consist of 6 Taintor gates, each having a clear span of 30 feet.

For this lake certain water-surface elevations were assumed for use in the design of the Barge canal. These elevations, referred to Barge canal datum, are as follows: Average high water, elevation 384.0; canal pool, or low navigable stage, elevation 381.5; average low water, elevation 380.0. By average surface is meant the water-surface unaffected by wind.

Records of water-surface fluctuations in this lake in addition to those previously published in various reports of the Department of State Engineer, of gages maintained at Ithaca, Cayuga and Mud lock, are those of Professor C. L. Crandall of Cornell University, Ithaca, which consist of observations at varying intervals, beginning January, 1879.

CAYUGA LAKE AT ITHACA

Gage No. 207

This station was established August 6, 1905, and maintained by the United States Geological Survey until 1909. During the year 1909 it was taken over by this Department.

The original gage was on the breakwater at the head of Cayuga lake and about 150 feet from the lighthouse. The gage was moved about November 1, 1912, to Smith's boat-house opposite the Cornell boat-house about a mile up the inlet and remained at this place until December 19, 1914, when it was abandoned. It was reëstablished January 23, 1915, at its present location. On July 11, 1916, a standard Type A gage, No. 207, was erected on the south side of Lane's dock at Willow Point, on the east shore about ¾ mile from the head of the lake. It has a range of 6 feet, between elevations 381.0 and 387.0. The gage bench-mark is a nail in the root of a buttonwood tree, north of Lane's boat-house, and is at elevation 387.50 (B. C. datum).

The gage is read once daily — A. M. — to half-tenths.

Daily elevation of water-surface (B. C. datum) of CAYUGA LAKE AT WILLOW POINT, NEAR ITHACA, for the year ended June 30, 1919. William H. Lane, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	383.65	383.5	383.6	383.2	382.4	382.3	383.25	383.05	382.85	382.8	383.6	384.9
2......	383.65	383.5	383.6	383.15	382.35	382.3	383.3	383.05	382.85	382.75	383.55	384.8
3......	383.7	383.5	383.6	383.1	382.3	382.3	383.3	383.0	382.9	382.7	383.55	384.75
4......	383.7	383.5	383.6	383.1	382.3	382.3	383.35	383.0	382.9	382.7	383.5	384.75
5......	383.7	383.5	383.65	383.0	382.3	382.35	383.35	383.0	382.9	382.75	383.5	384.7
6......	383.7	383.5	383.65	382.9	382.25	382.35	383.35	383.0	382.9	382.8	383.45	384.7
7......	383.7	383.5	383.6	382.8	382.25	382.35	383.3	382.95	382.95	382.9	383.4	384.7
8......	383.75	383.5	383.6	382.75	382.2	382.4	383.3	382.95	382.95	383.0	383.4	384.7
9......	383.75	383.6	383.6	382.7	382.2	382.45	383.3	382.9	382.95	383.1	383.35	384.65
10......	383.75	383.7	383.55	382.65	382.2	382.45	383.25	382.9	382.95	383.1	383.6	384.65
11......	383.75	383.7	383.55	382.6	382.2	382.5	383.25	382.9	383.0	383.2	383.8	384.65
12......	383.7	383.7	383.55	382.55	382.15	382.55	383.25	382.85	383.0	383.3	383.9	384.6
13......	383.7	383.7	383.52	382.5	382.15	382.6	383.2	382.85	383.0	383.4	384.0	384.6
14......	383.7	383.7	383.52	382.45	382.1	382.65	383.2	382.85	383.0	383.5	384.1	384.6
15......	383.7	383.65	383.5	382.4	382.1	382.7	383.2	382.9	383.0	383.55	384.2	384.55
16......	383.65	383.65	383.5	382.35	382.05	382.7	383.2	382.9	383.0	383.6	384.3	384.5
17......	383.65	383.65	383.52	382.3	382.05	382.75	383.15	382.9	383.1	383.6	384.3	384.45
18......	383.65	383.65	383.55	382.25	382.1	382.8	383.15	382.9	383.15	383.65	384.4	384.4
19......	383.65	383.65	383.55	382.2	382.15	382.8	383.15	382.85	383.2	383.65	384.45	384.45
20......	383.6	383.65	383.58	382.15	382.2	382.8	383.15	382.85	383.2	383.7	384.5	384.5
21......	383.6	383.65	383.6	382.1	382.2	382.85	383.2	382.85	383.2	383.7	384.5	384.5
22......	383.6	383.65	383.6	382.1	382.25	382.9	383.2	382.85	383.2	383.7	384.55	384.45
23......	383.6	383.65	383.6	382.1	382.25	382.95	383.2	382.8	383.1	383.7	384.85	384.4
24......	383.55	383.65	383.55	382.1	382.3	382.95	383.2	382.8	383.0	383.65	385.0	384.35
25......	383.55	383.6	383.5	382.0	382.3	383.0	383.2	382.8	383.0	383.65	385.2	384.35
26......	383.55	383.6	383.5	382.0	382.3	383.1	383.15	382.8	383.0	383.65	385.3	384.4
27......	383.55	383.6	383.45	382.0	382.3	383.15	383.15	382.85	383.0	383.6	385.4	384.4
28......	383.55	383.6	383.45	382.0	382.25	383.2	383.1	382.85	383.0	383.6	385.3	384.4
29......	383.55	383.6	383.4	382.0	382.25	383.2	383.1	......	383.0	383.6	385.2	384.35
30......	383.55	383.6	383.35	382.1	382.25	383.2	383.1	......	382.9	383.6	385.1	384.3
31......	383.55	383.6	......	382.2	......	383.25	383.05	......	382.9	......	385.0	.....

CAYUGA LAKE AT CAYUGA

Gage No. 206

This station is located at the village of Cayuga near the foot of Cayuga lake on the east shore. The station was established October 10, 1905, and was originally located near the crossing of the old Cayuga and Seneca canal and the Seneca river. It was moved to its present location May 16, 1914. On October 6, 1916, the direct-reading staff gage, on a pile opposite the N. Y. C. station, was replaced by a standard Type A gage, No. 206, in the same location. It has a range of 8 feet, between elevations 380.0 and 388.0. The gage bench-mark is on the southwest corner of concrete intake tank, on west side of N. Y. C. pumping station, and is at elevation 390.67 (B. C. datum).

The gage is read twice daily — at 7 A. M. and 5 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of Cayuga Lake at Cayuga, for the year ended June 30, 1919. T. Reagan, Observer

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	383.6	383.4	383.5	383.1	382.2	382.2	383.2	382.7	382.7	382.5	383.5	......
2	383.5	383.4	383.5	383.1	382.2	382.2	383.1	382.9	382.7	382.5	383.5	......
3	383.5	383.4	383.5	382.95	382.25	382.2	383.2	382.9	382.7	382.5	383.4	......
4	383.6	383.4	383.4	382.9	382.3	382.1	383.2	382.9	382.8	382.6	383.3	......
5	383.6	383.4	383.5	382.8	382.15	382.2	383.2	383.0	382.8	382.6	383.3	......
6	383.5	383.4	383.5	382.8	382.05	382.1	383.2	383.0	382.7	382.6	383.3	......
7	383.5	383.4	383.5	382.7	382.2	382.4	383.2	383.0	382.7	382.6	383.3	......
8	383.5	383.4	383.5	382.7	382.2	382.3	383.3	383.0	382.7	382.7	383.2	......
9	383.5	383.5	383.5	382.7	382.2	382.3	383.3	382.85	382.8	382.6	383.2	......
10	383.5	383.5	383.5	382.7	382.0	382.3	383.3	382.8	382.8	382.7	383.3	......
11	383.5	383.6	383.5	382.6	382.05	382.7	383.1	382.8	382.7	382.7	383.65	......
12	383.6	383.6	383.4	382.6	382.0	382.35	383.2	382.8	382.85	383.1	383.8	......
13	383.6	383.5	383.4	382.45	382.0	382.4	383.2	382.8	382.8	383.2	383.95	......
14	383.5	383.5	383.4	382.3	381.9	382.5	383.0	382.7	382.9	383.4	384.1	......
15	383.5	383.5	383.3	382.25	381.9	382.5	383.0	382.7	383.0	383.4	384.2	......
16	383.5	383.5	383.3	382.2	381.9	382.7	383.2	382.7	383.3	383.5	384.3	......
17	383.5	383.5	383.3	382.2	381.9	382.6	383.0	382.7	383.1	383.5	384.4	......
18	383.5	383.5	383.4	382.05	382.0	382.7	383.1	382.7	383.0	383.4	384.4	......
19	383.5	383.5	383.4	382.1	382.0	382.7	383.1	382.7	383.0	383.5	384.4	......
20	383.5	383.5	383.5	382.2	382.0	382.7	383.1	382.7	383.1	383.5	384.3	......
21	383.5	383.5	383.5	382.0	382.1	382.8	383.1	382.8	383.0	383.4	384.35	......
22	383.5	383.4	383.45	381.9	382.1	382.9	383.1	382.7	382.9	383.4	384.4	......
23	383.5	383.5	383.4	382.0	382.1	382.8	383.2	382.7	382.9	383.5	384.75	......
24	383.5	383.5	383.4	382.0	382.2	382.9	383.0	382.7	382.8	383.4	384.85	......
25	383.5	383.5	383.5	381.9	382.2	382.9	383.2	382.8	382.9	383.4	385.05	......
26	383.5	383.5	383.4	382.0	382.2	382.8	383.2	382.7	382.8	383.4	385.15	......
27	383.5	383.5	383.4	382.0	382.1	382.95	383.1	382.7	382.7	383.4	385.2	......
28	383.5	383.5	383.4	382.2	382.25	383.0	383.1	382.7	382.5	383.45	385.3	......
29	383.5	383.4	383.25	382.0	382.2	383.0	383.0	......	382.3	383.4	385.2	......
30	383.5	383.5	383.2	382.0	382.1	383.0	383.1	......	382.7	383.45	385.1	......
31	383.4	383.5	......	382.1	......	383.3	382.9	......	382.5	......	384.9	......

Note.— This station discontinued May 31, 1919.

CLYDE RIVER

DESCRIPTION

Clyde river joins Seneca river in the Montezuma marsh near the foot of Cayuga lake. Clyde river is formed by the junction of Canandaigua outlet and Ganargua creek, at Lyons. Its total length is about 20 miles and the greater portion of its course lies through a broad, marshy valley.

It is canalized throughout for the Barge canal and formed into three navigable pools, having low navigable water-surfaces referred to Barge canal datum as follows:

Above its confluence with the Seneca river by a dam at Baldwinsville on the latter stream, elevation 374.0; above the movable dam at May's Point, elevation 380.0; and above dam at Barge canal lock No. 26, about 2.3 miles downstream from Clyde, elevation 386.0.

CLYDE RIVER AT LYONS

Gage No. 215

This station, located in the village of Lyons, was established September 27, 1905. A standard chain gage is attached to the downstream side of the Geneva street bridge and has a range of 14 feet, the zero of the gage being elevation 385.0 (B. C. datum). During the years 1907 to 1910, inclusive, discharge was obtained at this station, but at present it is maintained for water-surface elevations only.

The gage is read once daily — at 1 P. M. — to tenths.

This gage was replaced by new gage at lock No. 27 on June 30, 1919.

Daily elevation of water-surface (B. C. datum) of CLYDE RIVER AT GENEVA ST., LYONS, for the year ended June 30, 1919. R. D. Putnam and E. J. Weber, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	385.2	385.1	385.1	385.3	385.5	385.4	384.8	386.1	385.3	386.5	383.0	385.8
2.....	385.2	385.0	385.2	385.0	385.6	385.0	385.0	386.1	385.2	386.5	387.4	385.8
3.....	385.3	385.4	385.3	385.4	385.4	385.2	385.1	386.1	385.2	386.5	387.0	385.7
4.....	385.4	385.2	385.2	385.4	385.4	385.5	384.9	386.2	385.4	386.7	386.8	385.5
5.....	385.4	385.1	385.3	385.4	385.3	385.2	385.0	386.2	385.1	386.6	386.9	385.5
6.....	385.2	385.2	385.3	385.4	385.4	385.0	385.7	386.1	386.3	386.4	386.7	385.7
7.....	385.2	385.3	385.5	385.3	385.7	385.0	386.2	386.1	386.4	386.4	385.5	386.3
8.....	385.2	385.3	385.8	385.4	385.3	385.2	386.2	386.1	386.4	386.7	385.4	386.5
9.....	385.2	385.4	385.3	385.3	385.3	384.7	386.2	386.1	386.5	386.7	385.5	387.4
10.....	385.2	385.3	385.5	385.4	385.3	384.6	386.2	386.0	386.8	387.0	385.5	387.7
11.....	385.2	385.3	385.2	385.3	385.3	384.6	386.2	386.0	386.7	387.5	389.0	387.0
12.....	385.4	385.4	385.3	385.3	385.4	385.0	386.2	386.0	386.5	389.3	389.0	386.5
13.....	385.2	385.1	385.0	385.2	385.3	384.7	386.1	385.9	386.4	388.0	388.3	386.8
14.....	385.3	385.2	385.2	385.3	385.3	384.9	386.1	385.9	386.3	387.0	386.8	386.5
15.....	385.3	385.2	385.3	385.4	385.3	384.9	386.2	386.1	386.3	386.8	385.8	386.7
16.....	385.2	385.4	385.3	385.1	385.3	385.7	386.2	386.2	386.3	386.6	385.6	386.5
17.....	385.2	385.4	385.5	385.5	385.5	385.0	386.2	386.2	387.0	386.6	386.0	386.5
18.....	385.2	385.3	385.6	385.3	385.5	384.7	386.2	386.2	387.0	386.5	386.1	386.4
19.....	385.3	385.6	385.1	385.1	385.1	385.1	386.3	386.2	386.6	386.4	385.8	386.4
20.....	385.3	385.1	385.4	385.5	385.4	385.3	386.4	386.2	386.5	385.5	385.7	386.3
21.....	385.3	385.3	385.1	385.3	385.5	384.9	386.4	386.2	386.3	384.0	386.5	386.5
22.....	385.2	385.3	385.3	385.2	385.4	385.0	386.3	386.2	386.3	381.7	387.5	386.3
23.....	385.2	385.5	385.2	385.4	385.2	384.9	386.4	386.4	386.2	381.6	389.8	386.3
24.....	385.1	385.4	385.3	385.2	385.6	387.0	386.4	386.5	386.2	382.2	391.1	386.3
25.....	385.1	385.4	385.4	385.4	385.6	386.3	386.2	386.5	386.3	382.6	390.2	386.3
26.....	385.2	385.2	385.4	385.5	385.4	386.5	386.4	386.2	386.3	382.3	388.8	386.4
27.....	385.2	385.3	385.3	385.5	385.3	386.3	386.2	385.5	386.3	382.9	387.3	386.8
28.....	385.3	385.4	385.4	385.2	385.4	385.4	386.3	385.3	386.3	383.0	386.4	386.4
29.....	385.1	385.1	385.2	385.6	385.2	384.7	386.3	......	386.3	383.0	386.9	386.6
30.....	385.4	385.4	385.3	385.5	385.3	384.6	386.3	......	386.4	382.8	385.9	386.2
31.....	385.8	385.2	......	385.6	......	384.8	386.2	......	386.4	......	386.0	......

NOTE.— This station discontinued June 30, 1919.

CLYDE RIVER AT CLYDE

Gage No. 214

This station is located in the village of Clyde; it was established October 20, 1905, as a discharge station, but on account of Barge canal construction, has been maintained since 1909 for water-surface elevations only. A standard chain gage, No. 214, was originally installed on the old Sodus street bridge and the datum was changed several times between April 1, 1916, and January 12, 1917, due to construction work and opening the gates of lock No. 26. On June 19, 1919, it was placed on the east side of the new viaduct near the north shore of the stream, about 400 feet downstream from the site of the old bridge. The gage has a range of 15 feet, between elevations 377.0 and 392.0. The gage

bench-mark, located on the top of pier No. 4, north shore, is at elevation 394.0, Barge canal datum.

The gage was read twice daily — at 7:30 A. M. and 5:30 to 6:30 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of CLYDE RIVER AT CLYDE, for the year ended June 30, 1919. H. K. Compson, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	384.24	384.44	384.29	384.44	384.54	384.34	383.84	385.29	384.59	385.69	381.89	384.49
2	384.29	384.29	384.29	384.34	384.64	384.24	383.99	385.29	384.29	385.64	385.99	384.44
3	384.24	384.44	384.34	384.49	384.49	384.19	384.04	385.24	384.29	385.69	385.94	384.49
4	384.29	384.34	384.39	384.44	384.54	384.49	383.59	385.29	384.59	385.74	385.89	384.34
5	384.39	384.29	384.49	384.44	384.49	384.24	384.74	385.29	384.39	385.69	385.74	384.44
6	384.24	384.34	384.34	384.29	384.59	384.59	385.29	385.24	385.44	385.49	384.54	384.99
7	384.39	384.39	384.54	384.39	384.69	384.24	385.19	385.24	385.54	385.49	384.44	385.54
8	384.24	384.54	384.64	384.39	384.34	384.19	385.29	385.19	385.59	385.79	384.39	385.59
9	384.29	384.64	384.44	384.49	384.44	383.79	385.29	385.09	385.74	385.84	384.39	385.99
10	384.29	384.54	384.49	384.19	384.54	383.59	385.19	385.14	385.84	385.89	384.54	386.09
11	384.49	384.39	384.54	384.44	384.49	383.69	385.29	385.19	385.69	386.24	386.14	385.59
12	384.49	384.44	384.59	384.39	384.44	384.04	385.19	385.09	385.59	386.74	386.44	385.49
13	384.44	384.39	384.34	384.39	384.39	383.94	385.24	384.99	385.39	385.89	385.79	385.59
14	384.39	384.39	384.44	384.39	384.44	383.74	385.34	384.99	385.39	385.74	384.84	385.39
15	384.39	384.34	384.44	384.39	384.34	383.79	385.24	385.29	385.49	385.54	384.54	385.44
16	384.24	384.34	384.54	384.14	384.44	383.99	385.34	385.34	385.49	385.49	384.49	385.39
17	384.24	384.29	384.59	384.39	384.54	383.79	385.39	385.29	385.89	385.49	384.89	385.54
18	384.24	384.39	384.44	384.49	384.64	383.84	385.39	385.39	385.84	385.54	384.44	385.39
19	384.44	384.59	384.24	384.24	384.39	384.04	385.44	385.29	385.64	385.39	384.54	385.90
20	384.34	384.09	384.44	384.59	384.34	383.94	385.39	385.29	385.39	384.49	384.49	386.00
21	384.54	384.34	384.24	384.44	384.59	383.89	385.49	385.29	385.39	382.19	384.99	386.25
22	384.24	384.34	384.34	384.24	384.49	383.84	385.49	385.34	385.39	380.59	385.49	386.05
23	384.34	384.54	384.49	384.54	384.39	383.94	385.49	385.49	385.29	380.34	386.74	386.10
24	384.44	384.59	384.39	384.34	384.54	384.99	385.59	385.54	385.49	380.74	387.79	386.10
25	384.39	384.54	384.44	384.44	384.44	385.44	385.49	385.54	385.49	381.09	387.29	386.10
26	384.14	384.59	384.34	384.39	384.44	385.54	385.54	385.19	385.39	380.94	386.44	386.15
27	384.29	384.44	384.49	384.49	384.34	385.39	385.44	384.54	385.39	381.14	385.19	386.40
28	384.44	384.49	384.44	384.49	384.34	384.54	385.39	384.39	385.49	381.24	385.19	386.15
29	384.29	384.39	384.44	384.69	384.34	383.54	385.49	......	385.39	381.29	385.19	386.25
30	384.54	384.54	384.44	384.59	384.44	383.89	385.39	......	385.59	381.04	384.59	386.15
31	384.34	384.49	......	384.59	......	383.89	385.39	......	385.64	......	384.54	......

BARGE CANAL ABOVE LOCK No. 25, AT MAY'S POINT

Gage No. 403

A new station was established during March, 1918, below lock No. 25, at May's Point. A standard Type A gage, No. 403, is located on the northwest needle wall of the lock. It has a range of 12 feet, between elevations 376.0 and 388.0, and is read by an employee of the Department of Public Works. A bronze plug is set in the wall, alongside the gage, at elevation 387.0 (B. C. datum), the top of the lock wall being at elevation 388.0. The gage bench-mark is the one used for gage No. 404.

The gage was read twice daily — at 9 A. M. and 4 P. M.— to tenths.

Daily elevation of water-surface (B. C. datum) of BARGE CANAL ABOVE LOCK No. 25, AT MAY'S POINT, for the year ended June 30, 1919. R. E. Fogarty, Observer

DAY	June	DAY	June	DAY	June
1	....	11	380.95	21	380.5
2	....	12	380.3	22	380.95
3	....	13	380.5	23	380.0
4	....	14	380.6	24	380.1
5	....	15	380.85	25	380.1
6	....	16	380.7	26	380.15
7	....	17	380.85	27	381.15
8	380.55	18	380.8	28	381.1
9	381.35	19	380.0	29	380.6
10	381.75	20	380.1	30	380.35

NOTE.— Readings begun June 8, 1919.

BARGE CANAL BELOW LOCK No. 25, AT MAY'S POINT

Gage No. 404

In March, 1918, a new station was established below lock No. 25, at May's Point. A standard Type A gage, No. 404, was placed on the east end of the north lock wall. It has a range of 12 feet, between elevations 369.0 and 381.0, and is read by an employee of the Department of Public Works. The gage bench-mark, a square cut on the steps on the east side of the power-house, is at elevation 393.821 (B. C. datum). A bronze plug is set in the lock wall alongside the gage at elevation 380.0. The top of the wall is at elevation 381.0.

The gage was read twice daily — at 9 A. M. and 4 P. M.— to tenths.

Daily elevation of water-surface (B. C. datum) at BARGE CANAL BELOW LOCK No. 25, AT MAY'S POINT, for the year ended June 30, 1919. R. E. Fogarty, Observer

DAY	June	DAY	June	DAY	June
1	....	11	378.35	21	375.55
2	....	12	377.9	22	375.9
3	....	13	377.5	23	375.75
4	....	14	377.55	24	375.8
5	....	15	377.4	25	375.7
6	....	16	377.5	26	375.65
7	....	17	377.35	27	375.89
8	377.05	18	376.9	28	376.1
9	377.7	19	376.05	29	376.0
10	378.5	20	375.75	30	375.85

NOTE.— Readings begun June 8, 1919.

GANARGUA CREEK

DESCRIPTION

Ganargua creek proper, often called Mud creek, rises near Victor. Its course is northeasterly to Macedon, then easterly. The tributary drainage is of the characteristic glacial kame type and the tributaries are rather sparse, flowing oftentimes first north and then south between elongated hills, until they find their way to Ganargua creek. The principal tributary of Ganargua creek is Mud creek, which rises in the hilly region near the head of Canandaigua lake and flows northward about 20 miles, entering Ganargua creek at Victor.

Ganargua creek, approaching from the south, has been incorporated in the Barge canal from about the western limits of the town of Palmyra eastward for about 2¾ miles to a spillway 360 feet long, 160 feet of which is at canal pool elevation 430.0 and the remainder one foot higher, over which it passes to the north towards Harrison's mill. About 1.2 miles east of where the creek enters the canal there is a 5-ft. x 7-ft. gate to supply water to Barnhart's mill and from below this mill to the spillway portions of the original creek channel have been straightened. Ganargua creek reënters the Barge canal just west of the village of Lyons and above the dam at lock No. 27, immediately above its confluence with Canandaigua outlet, forming the Clyde river.

GANARGUA CREEK NEAR PALMYRA

Gage No. 217

This station, established March 25, 1907, is located at Harrison's mill about 2½ miles east of Palmyra. The original gage, a staff fastened to the screen rack frame, was used until November 11, 1916, when a new standard gage, No. 217, was attached to the east wing wall of the south abutment of the highway bridge just above the mill. It has a range of 11 feet, between elevations 419.0 and 430.0. A standard bench-mark plug is set in the wing wall near the gage at elevation 428.0 (B. C. datum).

The gage was read twice daily to half-tenths and even hundredths.

Daily elevation of water-surface (B. C. datum) of GANARGUA CREEK NEAR PALMYRA, for the year ended June 30, 1919. C. H. Harrison, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	422.52	422.42	422.35	422.41	422.53	421.70	422.02	421.91	422.28	422.30	422.94	423.12
2	422.55	422.45	422.45	422.44	422.55	421.05	422.12	421.88	422.04	422.28	423.04	423.05
3	422.64	422.48	422.43	422.45	422.54	421.45	422.10	421.72	422.10	422.33	422.98	422.97
4	422.66	422.50	422.46	422.42	422.54	421.91	422.09	421.82	422.07	422.41	422.86	422.86
5	422.64	422.47	422.54	422.45	422.55	422.65	422.05	421.91	422.03	422.46	422.79	422.84
6	422.61	422.48	422.48	422.52	422.52	422.44	422.00	421.75	422.00	422.44	422.74	423.10
7	422.58	422.46	422.36	422.51	422.54	422.70	421.84	421.75	422.02	422.52	422.64	422.96
8	422.68	422.49	422.36	422.54	422.55	422.64	421.98	421.72	421.99	422.64	422.61	423.08
9	422.58	422.46	422.36	422.40	422.59	422.56	421.97	421.65	422.31	422.87	422.32	424.40
10	422.65	422.49	422.39	422.55	422.51	422.70	422.02	421.55	423.18	423.04	422.15	423.58
11	422.85	422.54	422.48	422.60	422.51	422.65	421.88	421.59	423.00	423.76	424.60	423.14
12	422.72	422.48	421.84	423.00	422.53	422.76	421.96	421.65	422.58	424.90	424.12	423.01
13	422.66	422.41	422.32	422.50	422.56	422.62	422.00	421.61	422.45	423.42	423.80	422.95
14	422.64	422.52	422.38	422.45	422.47	422.62	422.10	421.71	422.30	423.28	423.08	422.98
15	422.66	422.49	422.39	422.65	422.50	422.80	421.99	421.73	422.20	423.28	422.42	422.93
16	422.68	422.48	422.39	422.45	422.80	422.62	422.02	421.96	422.31	423.18	422.59	422.81
17	422.65	422.43	422.56	422.05	422.51	422.55	421.98	421.96	423.04	423.00	422.91	423.05
18	422.59	422.38	422.47	422.50	422.62	422.92	422.00	421.90	423.00	423.02	422.58	422.72
19	422.66	421.49	422.49	422.50	422.07	423.48	422.06	421.94	422.76	422.95	422.75	422.70
20	422.59	422.12	423.12	422.50	422.49	423.35	422.12	421.84	422.50	422.76	422.92	422.74
21	423.05	422.42	422.81	422.52	422.59	423.22	422.08	421.81	422.42	422.69	424.65	422.88
22	422.52	422.44	422.33	422.52	422.40	423.16	422.05	421.80	422.29	422.59	424.82	422.88
23	422.56	422.44	422.44	422.52	422.51	423.16	422.05	422.09	422.26	422.45	426.12	422.88
24	422.59	422.46	422.38	422.55	422.53	423.00	422.04	422.14	422.25	422.60	425.25	422.78
25	422.56	422.42	422.49	422.41	422.50	422.99	422.10	422.05	422.10	422.82	424.24	422.77
26	422.59	422.38	422.47	422.52	422.46	422.96	422.06	422.06	422.11	422.84	423.88	422.78
27	422.42	422.44	422.45	422.50	422.51	422.72	422.08	422.25	422.10	422.92	423.57	423.15
28	422.52	422.44	422.43	422.58	422.49	422.50	422.00	421.99	422.10	423.07	423.53	423.00
29	422.49	422.44	422.43	422.53	422.49	422.15	421.92	......	422.12	423.09	423.28	422.85
30	422.49	422.72	422.46	422.49	422.45	422.14	421.95	......	422.25	423.03	423.40	422.78
31	422.49	422.28	......	422.50	......	422.00	421.90	......	422.40	......	423.09	......

CANANDAIGUA OUTLET

DESCRIPTION

Canandaigua lake occupies one of the elongated depressions extending in nearly a north and south direction in the central lake region of New York. The drainage tributary to the lake is chiefly short lateral streams from the steep slopes of adjacent hill-sides. The outflow from the lake is regulated to some extent by gates. The lake is at elevation about 686. From the foot of the lake at Canandaigua the outlet flows northward to Manchester, a distance of 7 miles. In this distance a fall of 100 feet occurs,

which is chiefly concentrated at several water-power dams. From Manchester the stream flows easterly 12 miles and thence northeasterly 8 miles, joining Ganargua creek at Lyons to form the Clyde river. In the easterly portion of its course the stream winds with large bends through a broad sloping valley of fertile land. The fall is mostly utilized at water-power dams. The tributary drainage is moderately rolling and is interspersed with glacial kames. These are lenticular hills extending usually in a north and south direction. At Phelps, Flint creek, which is the largest tributary, enters the outlet. Flint creek drains a valley similar to the adjacent lake basins. This valley is not at present occupied by a lake, but contains an extensive swamp, reaching several miles southward from Gorham.

CANANDAIGUA OUTLET AT ALLOWAY

Gage No. 216

Location.— At a highway bridge crossing the stream in the village of Alloway about 2½ miles upstream, or south of Lyons.

Drainage area.— 440 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— September 18, 1906, to June 30, 1919.

Gage.— The original staff gage was replaced on November 7, 1916, by a standard Type A gage secured to the north wing of the west abutment of the highway bridge and has a range of 11½ feet, between elevations 402.5 and 414.0. A standard bench-mark plug is set near the gage at elevation 410.0 (B. C. datum). The gage is read twice daily — between 7 and 8 A. M. and 4 and 7 P. M.— to half-tenths.

Discharge measurements.— Current-meter measurements made from the highway bridge, which has a span of 95 feet.

Control.— Except during low stages the control at this station is Slaters dam, located about two miles below the bridge, together with the slope upstream. Sluice-gates at the dam are kept open always, water passing over the crest only during extremely high flows.

Extremes of discharge.— 1906–1918: Maximum stage recorded, March 29, 1916, at 8:30 A. M., elevation 412.5; discharge estimated as 3,870 second-feet. Minimum stage recorded, elevation 403.0 on December 24, 1916, at 4:20 P. M.; discharge, estimated at 2 second-feet.

Regulation.— Daily flow materially affected by operation of grist-mill a quarter mile above station.

Accuracy.— Discharge rating curve fairly well defined for flows below 1,000 second-feet. Higher flows estimated.

Daily elevation of water-surface (B. C. datum) of CANANDAIGUA OUTLET AT ALLOWAY, for the year ended June 30, 1919. Carl Tuscher, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	404.60	404.50	403.85	......	......	404.20	404.40	404.22	404.50	404.40	405.60	406.88
2	404.60	404.50	403.85	......	......	404.18	404.40	404.20	404.10	404.40	405.62	406.50
3	404.42	404.50	......	......	......	404.25	404.40	404.22	404.10	404.42	405.52	406.25
4	404.75	404.50	......	......	......	404.30	404.40	404.25	404.10	404.40	405.40	406.08
5	404.60	404.50	......	......	......	404.95	404.40	404.22	404.10	404.50	405.50	405.78
6	404.42	404.30	......	......	404.38	404.10	404.40	404.20	404.48	404.55	405.52	405.62
7	404.40	404.28	......	......	404.70	403.80	404.40	404.20	404.12	405.02	405.50	405.65
8	404.30	404.30	......	......	404.40	404.10	404.40	404.12	404.10	405.12	405.35	405.42
9	404.30	404.30	......	......	404.40	404.60	404.32	404.10	404.60	405.10	405.22	407.75
10	404.20	404.30	......	......	404.10	404.30	404.20	404.10	405.55	405.92	406.20	406.82
11	404.45	404.30	......	......	404.10	404.48	404.12	404.10	405.05	407.58	410.90	406.20
12	404.32	404.30	......	......	404.10	404.60	404.10	404.10	404.75	409.35	408.45	406.00
13	404.30	404.30	......	......	404.10	404.60	404.10	404.00	404.60	406.95	408.40	405.90
14	404.40	404.15	......	......	404.10	405.12	404.10	404.30	404.40	406.65	407.65	405.78
15	404.30	404.40	......	......	404.05	405.00	404.10	404.32	404.30	406.40	407.50	405.85
16	404.28	404.30	......	......	404.00	404.90	404.18	404.15	404.60	406.32	407.00	405.92
17	404.22	404.30	......	......	404.00	404.70	404.28	404.15	406.58	406.15	406.85	405.95
18	404.20	404.30	......	......	404.45	404.60	404.32	404.15	405.90	406.00	406.88	405.80
19	404.20	404.30	......	......	404.60	404.60	404.40	404.15	405.30	405.60	406.60	405.90
20	404.30	404.30	......	......	404.40	404.60	404.40	404.12	405.05	405.40	406.52	405.78
21	404.30	404.30	......	......	404.40	404.45	404.40	404.15	405.00	405.30	407.55	405.80
22	404.30	404.25	......	......	404.60	404.50	404.40	404.18	405.00	405.30	408.50	405.80
23	404.40	404.20	......	......	404.30	404.70	404.30	404.40	405.00	404.90	409.80	405.72
24	404.40	404.20	......	......	404.30	404.70	404.30	404.35	404.75	405.05	410.05	405.72
25	404.05	404.15	......	......	404.32	404.70	404.30	404.30	404.72	405.58	409.72	405.62
26	404.50	404.00	......	......	404.42	404.65	404.30	404.30	404.70	405.62	408.40	405.60
27	404.30	404.00	......	......	404.30	404.40	404.30	404.40	404.62	405.90	408.30	406.55
28	404.25	404.00	......	......	404.30	404.40	404.35	404.35	404.70	405.82	407.85	406.40
29	404.72	404.00	......	......	404.10	404.40	404.35	......	404.58	405.75	407.20	406.40
30	404.62	404.00	......	......	404.20	404.40	404.30	......	404.42	405.62	407.12	405.60
31	404.50	404.00	......	......	......	404.40	404.20	......	404.45	......	407.10	......

NOTE.— Elevations from September 3 to November 5 doubtful.
Water-surface elevations are means of two readings daily.

OWASCO OUTLET

DESCRIPTION

Owasco lake is one of the finger lake group in central New York and is generally rated as the sixth in size. It is about 11 miles long and has a maximum width of 1.25 miles. It has a water-surface area of approximately 10.4 square miles and is drained by Owasco outlet.

The lake extends in a north and south direction and lies wholly within the boundaries of Cayuga county. The southern half of the lake, on both the east and west sides, is flanked by steep, sloping hills, rising to elevations of 500 to 800 feet above the lake surface, which is at an elevation of 710 feet above tide-water. These hills are rather deeply indented by numerous small streams that enter the lake at almost right angles from either side. To the south of the head of the lake and extending for some 17 or 18 miles is a rather narrow valley, the floor of which is about one-half mile wide at the lake and narrows as it approaches the southern extremity. This valley is drained by Owasco inlet, which rises near Freeville in Tompkins county.

The dividing line for the drainage basin is at an elevation of from 700 to 1,300 feet above sea-level on the west and attains an altitude of some 1,600 feet on the east. The western line falls about 2 miles back from the lake; the eastern divide extends some 7 or 8 miles. The general shape of the drainage basin is long and narrow, the northern end terminating on the shores of Seneca river, into which the waters drain.

Owasco lake occupies about the center of the drainage basin north and south. Northward from the foot of the lake the descent is very rapid, there being 325 feet fall in the 17 miles between the outlet and Seneca river. One hundred and ten feet of this fall is practically within the city limits of Auburn and is utilized by the numerous manufacturing interests in that city. From a point just above Throopsville to Port Byron, a distance of about 5 miles, there is a fall of 130 feet, very little of which is developed. A State dam about one mile below the outlet of the lake practically controls the low and medium flow of this drainage basin. The drainage area is representative of the farming district in central New York and is fairly well timbered.

OWASCO OUTLET NEAR AUBURN

Location.— On the farm of Charles H. Pearce, 2 miles below the center of the city of Auburn, Cayuga county, and 3¾ miles below the State dam at the outlet of Owasco lake.

Drainage area.— 206 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— November 17, 1912, to June 30, 1919.

Gage.— Gurley water-stage recorder in a concrete shelter on the left bank on the farm of Charles H. Pearce; inspected by Charles H. Pearce.

Discharge measurements.— Made by wading directly opposite the gage in low water and from a cable at the same section in high water.

Channel and control.— A low concrete control has been constructed about 15 feet below the gage. Crest of control is 1 foot wide and the slopes of both upstream and downstream faces are 1 on 2. A small horizontal apron built on a level with the bed of the stream extends downstream 2½ feet from toe of dam. Mean elevation of the left end of the dam for a distance of 50 feet is at gage height 1.28 feet; the remaining 50 feet of the crest of the dam is at gage height 2.13 feet.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 3.55 feet at 9 A. M., April 12; discharge, 1,150 second-feet. Minimum stage from water-stage recorder, 1.63 feet at 1 A. M., September 7; discharge, 33 second-feet.

1912–1919: Maximum stage, 6.4 feet during period March 25 to 30, 1913, determined by leveling from flood-marks; discharge, 2,750 second-feet. Minimum stage from water-stage recorder, 1.41 at 1 A. M., October 15, 1915; discharge, 5.6 second-feet.

Ice.— Stage-discharge relation seldom affected by ice.

Diversions.— An average flow of about 10 second-feet is pumped from Owasco lake for the municipal water-supply of the city of Auburn. Proportion returning to stream above the gaging station is not known.

Regulation.— Large diurnal fluctuation in flow during low-water periods, due to mills in the city of Auburn; seasonal flow regulated at the State dam at the outlet of Owasco lake.

Accuracy.— Stage-discharge relation permanent; not affected by ice during year. Rating curve well defined between 1 and

1,700 second-feet. Operation of the water-stage recorder fairly satisfactory during periods when it was in operation. Daily discharge ascertained by averaging the hourly discharge. Records excellent, except for periods of no gage-height records.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurement of OWASCO OUTLET NEAR AUBURN, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 11........	E. D. Burchard..................................	2.43	254

Daily discharge, in second-feet, of OWASCO OUTLET NEAR AUBURN, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	206	194	134	129	150	139	360	201	201	374	559	280
2.....	206	205	149	123	150	156	368	189	171	384	582	250
3.....	206	195	157	125	150	157	383	198	196	394	539	230
4.....	206	166	156	141	150	154	372	189	187	390	528	220
5.....	206	191	159	145	150	151	383	190	192	445	544	210
6.....	206	205	147	106	150	152	388	190	191	519	456	200
7.....	206	204	141	144	150	150	384	190	208	688	381	190
8.....	206	209	132	138	150	146	371	197	196	663	367	180
9.....	206	196	149	136	150	154	368	185	204	641	375	180
10.....	206	190	150	131	150	154	377	209	214	698	461	190
11.....	188	185	145	131	150	150	371	199	217	881	639	200
12.....	166	180	155	113	150	142	373	194	219	1,000	772	200
13.....	168	180	177	71	150	152	377	194	221	925	826	200
14.....	160	180	183	134	150	189	336	190	223	941	776	208
15.....	168	176	96	142	150	174	290	190	228	908	738	194
16.....	171	194	137	146	150	172	292	198	276	897	726	193
17.....	162	168	181	139	150	169	259	209	380	864	749	181
18.....	161	185	167	143	150	170	263	200	390	799	725	181
19.....	165	175	159	154	150	173	243	181	390	738	709	171
20.....	171	177	188	98	150	168	236	98	398	702	700	163
21.....	181	175	169	96	150	167	223	192	392	649	650	206
22.....	191	183	77	141	150	177	234	192	386	620	540	171
23.....	178	179	124	162	165	209	230	181	378	580	700	175
24.....	184	163	80	167	147	236	238	193	382	550	720	189
25.....	185	174	137	153	161	234	237	198	375	540	728	165
26.....	190	175	134	136	168	292	218	194	368	520	743	197
27.....	190	173	126	101	155	374	210	193	368	508	591	183
28.....	190	167	116	162	142	379	200	194	371	500	451	178
29.....	190	167	92	171	151	364	195	......	379	492	370	185
30.....	195	162	138	193	149	376	189	......	380	493	330	176
31.....	195	172	......	140	......	365	194	......	389	......	300	......
Mean...	187	182	142	136	151	205	296	190	293	643	590	193

NOTE.— Mean discharge, July 1 to 10, estimated, 206 second-feet, and November 1 to 22, 150 second-feet. Discharge estimated, October 31, January 27 and 28, February 5 to 7 and 14 and 15, April 22 to 26, May 20 to 24 and 29 to 31 and June 1 to 13, from precipitation and temperature record and observer's weekly readings of gage height.

Monthly discharge of OWASCO OUTLET NEAR AUBURN, for the year ended June 30, 1919
[Drainage area, 206 square miles.]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	....	160	187	0.908	1.05
August	209	162	182	0.883	1.02
September	188	77	142	0.689	0.77
October	193	71	136	0.660	0.76
November	....	....	151	0.733	0.82
December	379	139	205	0.995	1.15
January	388	189	296	1.44	1.66
February	209	98	190	0.922	0.96
March	398	171	293	1.42	1.64
April	1,000	374	643	3.12	3.48
May	826	a 300	590	2.86	3.30
June	a 280	133	193	0.937	1.05
The year	1,000	71	267	1.30	17.66

a Estimated.

ONONDAGA LAKE

DESCRIPTION

Onondaga lake, situated north of the city of Syracuse, is about 4½ miles long, having an average width of 1 mile and a surface area of 4.7 square miles. The surface elevation is about 365, Barge canal datum, and has an average annual range of nearly 6 feet.

The drainage area, including the lake surface, is about 288 square miles, lying mostly to the south and southwest. Included in this area is Otisco lake with a water-surface of 3.3 square miles, discharging through Nine-Mile creek, and a group of small lakes drained by Onondaga creek. Besides these principal tributaries there are a few small streams entering the lake from the north and east.

Onondaga lake discharges into the Seneca river through Onondaga outlet, which is canalized as a part of the Barge canal system. A low navigable stage at elevation 363.0 will be maintained on this lake by the dam on the Oswego river at Phoenix.

ONONDAGA LAKE AT SYRACUSE

Gage No. 213

This station is located at the head, or south end of Onondaga lake. Until October 1, 1916, the water-surface was obtained by measuring down from a reference point on the west abutment of the New York Central railroad bridge over Onondaga creek. Since that date the reference point has been located at the new New York Central railroad bridge over the terminal channel at Syracuse, being on the top of the pier on the east side of the channel at the angle in the pier near the north girder of the bridge.

The gage is read once daily — about noon — to tenths.

Daily elevation of water-surface (B. C. datum) of ONONDAGA LAKE AT SYRACUSE, for the year ended June 30, 1919. R. D. Smith, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	363.8	363.8	*a*	364.2	364.3	*a*	*a*	364.1	364.2	365.0	365.5	*a*
2.....	363.8	363.7	*a*	364.1	364.3	363.9	364.2	*a*	*a*	364.9	365.6	365.6
3.....	363.7	363.6	363.5	364.1	*a*	363.9	364.2	364.0	364.4	364.9	365.4	365.2
4.....	*a*	*a*	363.5	364.1	364.3	363.9	364.2	364.1	364.4	365.0	*a*	364.6
5.....	363.9	363.8	363.4	364.1	*a*	363.8	*a*	364.0	364.7	365.3	365.2	364.4
6.....	363.8	363.7	363.5	*a*	364.2	364.1	364.2	364.1	364.4	*a*	365.2	364.1
7.....	363.7	363.7	363.3	364.2	364.1	363.9	364.1	364.3	364.4	365.2	365.1	364.2
8.....	363.6	363.6	363.4	364.3	364.0	*a*	364.0	363.3	364.3	365.2	365.0	*a*
9.....	363.8	363.7	363.5	364.2	364.0	363.9	364.1	*a*	*a*	365.3	364.8	364.9
10.....	363.9	363.8	363.3	364.1	364.0	364.1	364.0	364.1	365.1	365.3	364.9	364.7
11.....	*a*	*a*	363.3	364.0	363.9	364.1	363.9	364.0	365.3	365.5	*a*	364.9
12.....	364.0	364.0	363.3	*a*	364.0	363.9	*a*	364.0	365.1	366.2	365.7	364.9
13.....	363.8	363.7	363.6	*a*	363.9	364.1	364.4	363.9	365.0	*a*	366.1	364.7
14.....	*a*	363.6	363.4	364.2	363.8	364.3	364.4	364.2	364.8	366.7	366.2	364.5
15.....	363.9	363.6	*a*	363.9	364.1	*a*	364.3	364.2	364.7	366.4	365.9	*a*
16.....	363.8	363.6	363.8	363.9	364.1	364.4	364.2	*a*	*a*	366.9	365.5	364.5
17.....	363.8	363.5	363.7	363.9	*a*	364.3	364.2	364.1	364.8	365.7	365.3	364.5
18.....	363.8	*a*	363.8	363.9	364.3	*a*	364.1	364.1	365.1	365.4	*a*	364.5
19.....	363.7	363.5	363.8	363.9	364.4	363.9	*a*	364.0	365.4	365.2	365.3	364.3
20.....	363.8	363.5	363.9	*a*	364.3	364.1	364.2	363.9	365.4	*a*	365.3	364.0
21.....	*a*	363.5	364.2	364.1	364.3	364.1	364.1	363.8	365.4	365.1	365.2	364.0
22.....	364.0	363.5	*a*	363.9	364.1	*a*	364.1	363.7	365.2	365.2	365.3	*a*
23.....	363.8	363.4	364.2	363.9	364.1	364.2	364.1	*a*	*a*	365.2	365.8	364.0
24.....	363.8	363.3	364.1	363.9	*a*	364.3	364.6	364.2	364.9	365.2	366.2	364.1
25.....	363.9	*a*	364.1	363.9	363.9	*a*	364.4	364.2	364.9	365.2	*a*	364.0
26.....	363.9	363.5	363.9	364.1	363.9	364.5	*a*	364.3	364.8	365.2	366.6	363.9
27.....	363.9	363.4	364.1	*a*	364.1	364.3	364.3	364.2	364.8	*a*	366.6	363.9
28.....	*a*	363.4	364.4	363.9	*a*	364.2	364.2	364.1	365.0	365.2	366.3	364.0
29.....	364.0	363.4	*a*	364.1	363.9	*a*	364.2	......	365.0	365.5	366.0	*a*
30.....	363.9	*a*	364.2	364.1	363.9	364.1	364.1	......	*a*	365.0	365.7	364.0
31.....	363.9	363.3	......	364.3	......	363.9	364.2	......	364.9	......	365.6	......

a No record.

ONONDAGA OUTLET AT LONG BRANCH

Gage No. 212

New gage No. 212, a standard Type A gage, was established December 19, 1917, at the Long Branch boat-house on Onondaga lake outlet, on the southeast, or upstream, corner of the building. It has a range of 8 feet, between elevations 363.0 and 371.0. The gage bench-mark is a nail in the root of a maple tree west of trolley tracks, west approach to Outlet bridge, at elevation 374.21 (B. C. datum). This gage supersedes old No. 212, of the same title, discontinued September 30, 1917, and also No. 197, formerly published as "Seneca River at Mud Lock, near Long Branch," discontinued October 31, 1917.

It is read twice daily — at 8 A. M. and 5 P. M. — to half-tenths.

Daily elevation of water-surface (B. C. datum) of ONONDAGA OUTLET AT LONG BRANCH, for the year ended June 30, 1919. Marcus A. Smith, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	363.85	363.82	363.38	364.20	364.35	363.85	363.90	364.00	364.10	364.90	365.50	365.70
2.....	363.65	363.72	363.58	364.12	364.22	364.10	364.10	364.00	364.30	364.85	365.60	365.60
3.....	363.75	363.72	363.58	364.12	364.32	364.02	364.20	364.00	364.45	364.90	365.40	365.10
4.....	363.82	363.72	363.60	364.10	364.38	363.92	364.20	364.10	364.40	365.10	365.20	364.60
5.....	363.90	363.88	363.55	364.15	364.25	363.88	364.10	364.10	364.50	365.30	365.20	364.40
6.....	363.80	363.80	363.48	364.20	364.20	363.92	364.10	364.10	364.40	365.20	365.15	364.20
7.....	363.80	363.72	363.45	364.38	364.12	363.92	364.00	364.30	364.35	365.15	365.10	364.30
8.....	363.65	363.72	363.48	364.38	364.08	363.88	364.00	364.30	364.30	365.10	364.95	364.50
9.....	363.65	363.80	363.68	364.22	364.02	364.05	364.05	364.10	364.50	365.30	364.80	364.60
10.....	363.75	363.78	363.58	364.12	363.95	364.08	364.00	364.10	365.05	365.40	365.00	364.75
11.....	363.92	363.85	363.58	364.10	363.95	364.00	364.10	364.00	365.20	365.60	365.40	364.95
12.....	363.95	364.00	363.62	364.22	364.08	363.88	364.30	363.95	365.10	366.30	365.80	364.90
13.....	363.92	363.82	363.72	364.20	363.92	364.08	364.40	364.00	364.90	366.75	366.15	364.70
14.....	363.90	363.78	363.72	364.15	363.92	364.25	364.35	364.15	364.80	366.70	366.20	364.50
15.....	363.88	363.68	363.82	364.08	364.12	364.35	364.30	364.10	364.65	366.40	365.90	364.50
16.....	363.90	363.60	363.90	364.02	364.18	364.40	364.20	364.10	364.55	366.50	365.50	364.50
17.....	363.92	363.52	363.98	364.05	364.18	364.32	364.20	364.10	364.80	365.65	365.25	364.60
18.....	363.88	363.65	363.95	363.98	364.32	364.22	364.15	364.00	365.15	365.40	365.30	364.60
19.....	363.85	363.78	364.05	363.98	364.42	364.12	364.20	364.00	365.40	365.20	365.25	364.30
20.....	363.80	363.68	364.28	364.02	364.35	364.02	364.20	363.90	365.40	365.10	365.30	364.10
21.....	363.95	363.58	364.22	364.10	364.15	364.02	364.10	363.80	365.30	365.15	365.25	364.00
22.....	364.02	363.58	364.22	364.00	364.08	364.05	364.10	363.70	365.10	365.25	365.30	363.90
23.....	363.90	363.50	364.28	364.02	364.05	364.15	364.15	363.80	365.00	365.20	365.85	364.05
24.....	363.98	363.42	364.22	364.02	363.95	364.28	364.50	364.15	364.90	365.20	366.25	364.10
25.....	363.90	363.40	364.18	364.00	363.92	364.38	364.30	364.20	364.90	365.20	366.50	364.10
26.....	363.98	363.58	364.22	364.12	363.90	364.42	364.25	364.30	364.80	365.20	366.60	364.00
27.....	363.98	363.52	364.38	364.20	363.98	364.38	364.25	364.20	364.80	365.25	366.60	364.00
28.....	363.95	363.58	364.38	364.15	363.92	364.25	364.20	364.10	364.75	365.30	366.35	364.05
29.....	364.10	363.35	364.28	364.10	363.92	364.05	364.20	......	364.80	365.50	365.95	364.10
30.....	364.02	363.35	364.20	364.18	363.82	364.08	364.10	......	364.80	365.50	365.80	364.05
31.....	363.95	363.30	......	364.38	......	363.95	364.10	......	364.90	......	365.70	......

ONEIDA RIVER BASIN

DESCRIPTION

The territory drained by the Oneida river is, in shape, roughly a square of about 40 miles on the side, lying west of the upper portion of the Mohawk drainage basin. From its northeast corner a peninsula-like area of about 80 square miles, drained by the upper portion of East branch, Fish creek, projects northward between the Salmon and Black river drainage areas.

The total drainage area is 1,493 square miles, of which the run-off from 1,353 square miles, or slightly over 90 per cent, passes through Oneida lake, which has a water-surface of 78 square miles, or 5¾ per cent of the area above its outlet, and an annual range of surface of about 3 to 6 feet, which together with the dam and gate at Caughdenoy offers facilities for considerable regulation of the flow in the Oneida river.

There is a small amount of local storage for and diversion to the old Erie canal in the southern portion of this basin. Water is also diverted into this drainage area from the Black and Mohawk basins through the summit levels of the old Erie and new Barge canals.

The overflow from this basin through the Oneida river unites with that of the Seneca river at Three River Point to form the Oswego river.

For table of areas of this drainage basin see page 73.

ONEIDA RIVER

The Oneida river is a winding stream about 17¾ miles long, extending from Brewerton at the outlet of Oneida lake to Three River Point, where it unites with the Seneca to form the Oswego river.

The Oneida river has been canalized in connection with the construction of the Barge canal. Two large and two smaller bends have been cut off, but on the largest cut-off, that opposite the new Caughdenoy dam, is located Barge canal lock No. 23 and

normally only that portion of the flow of the river required for canal purposes at the lock passes through this channel.

About 4 miles below Brewerton and about 2½ miles below the east end of the Caughdenoy cut-off and about 600 feet above the old lock and highway bridge, a dam has been constructed to retain a low navigable surface in Oneida lake and above lock No. 23 at elevation 369.9. This dam is a concrete structure with a straight ogee type crest 415 feet long at elevation 369.63. In the old canal lock a vertical lift-gate has been constructed with a clear span of 30 feet 9 inches and sill at elevation 362.73. The dam was completed in the summer of 1909, and the gate, January 1, 1914.

Below lock No. 23 a low navigable surface is maintained at elevation 363.0 by the dam on the Oswego river at Phoenix.

Occasional apparent inconsistencies in the tables of water-surface elevation, where the water-level at an upstream gage is recorded slightly lower than at a point farther downstream, are, as a rule, not the result of actual mistakes, but arise from the fact that most of the gages are read to the nearest tenth of a foot only, and also from the fact that streams and lakes are sometimes affected by wind to such an extent as to cause the water-surface to be slightly higher at the downstream end of a level reach than at the upstream end.

ONEIDA RIVER AT BREWERTON

Gage No. 185

This station is located on the Oneida river at Brewerton about 1,500 feet downstream from Oneida lake and indicates lake surface very closely. It was established April 22, 1904, to determine water-surface elevations only. The staff gage on the downstream side of the New York State boat-house was superseded on July 21, 1916, by a standard Type A gage. This gage, No. 185, is secured to the east end of the concrete dock below the Brewerton highway bridge and has a range of 8 feet, between elevations 368.0 and 376.0. The gage bench-mark is a square chisel cut, in top of concrete dock wall about 3 feet from the end and is at elevation 375.372 (B. C. datum).

The gage is read once daily — A. M. — to half-tenths.

Daily elevation of water-surface (B. C. datum) of ONEIDA RIVER AT BREWERTON, for the year ended June 30, 1919. A. R. Merritt, Observer

DAY	July	Aug.	Se t.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	370.5	370.45	370.2	371.0	371.2	370.75	371.15	371.15	370.85	371.9	372.25	372.0
2.....	370.5	370.45	370.15	371.0	371:3	370.7	371.15	371.1	370.9	371.9	372.2	371.95
3.....	370.5	370.45	370.15	371.0	371.3	370.6	371.2	371.1	371.0	371.9	372.25	371.8
.....	370.5	370.4	370.2	371.0	371.35	370.45	371.25	371.1	371.15	371.95	372.2	371.75
5.....	370.45	370.35	370.2	371.0	371.4	370.45	371.25	371.05	371.15	371.95	372.2	371.7
6.....	370.45	370.35	370.2	371.5	371.35	370.4	371.3	371.05	371.2	372.0	372.25	371.6
7.....	370.4	370.4	370.15	371.5	371.3	370.4	371.3	371.0	371.25	372.1	372.3	371.5
8.....	370.4	370.45	370.2	371.1	371.25	370.4	371.3	371.0	371.3	372.2	372.15	371.4
9.....	370.35	370.5	370.2	371.15	371.2	370.35	371.3	370.95	371.4	372.2	372.2	371.3
10.....	370.4	370.5	370.2	371.1	371.2	370.4	371.25	370.95	371.5	372.2	372.25	371.25
11.....	370.45	370.	370.15	371.05	371.15	370.4	371.2	370.9	371.6	372.55	372.3	371.2
12.....	370.5	370.5	370.1	371.0	371.1	370.45	371.2	3 0.85	371.7	372.8	372.2	371.3
13.....	370.5	370.5	370.15	370.95	371.0	370.5	371.15	370.9	371.8	372.95	372.25	371.15
14.....	370.55	370.45	370.15	370 9	370.9	370.55	371.1	370.9	371.8	373.1	372.25	371.1
15.....	370.6	370.4	370.2	370.8	370.85	370.7	371.1	370 9	371 8	373.1	372.2	371.1
16	370.6	370.4	370.25	370.8	370.8	370.8	371.1	370.9	371.8	373.5	372.2	371.1
17.....	370.6	370.4	370.3	370.7	370.8	370.9	371.05	370.9	371.9	372.9	372.25	371.1
18.....	370.65	370.35	370.4	370.7	370.85	371.0	371.0	370.9	371.95	372.85	372.3	371.0
19.....	370.7	370.3	370.5	370.65	370.85	370.95	371.0	370.9	372.0	372.8	372.35	3 1.0
20.....	370.7	370.3	370.6	370.6	370 8	370.9	371.0	370.9	372.0	372.75	372.4	370.9
21.....	370.7	370.25	370.75	370.6	370.8	370.9	370.95	370.85	372.05	372.7	372.35	370.9
22.....	370.7	370.2	370.9	370.6	370.75	370.9	370.9	370.85	372.0	372.6	372.4	370.9
23.....	370.7	370.25	370.95	370.65	370.75	370.9	371.0	370.8	372.0	372.5	372.4	370.85
24.....	370.65	370.3	370.95	370.65	370.75	371.0	371.05	370.8	372.05	372.15	372.4	370.85
25.....	370.65	370.3	371.0	370.7	370.75	371.15	371.1	370.8	372.1	372.3	372.4	370.8
26.....	370.65	370.3	371.0	370.8	370.7	371.3	371.15	370 8	372.05	372.15	372.45	370.8
27.....	370.6	370.25	371.1	370.9	370.75	371.3	371.2	370.85	372.0	372.2	372.4	370.75
28.....	370.6	370.25	371.1	371.0	370.8	371.25	371.2	370.85	372.0	372.3	372.35	370.75
29.....	370.55	370.25	371.1	371.0	370.7	371.1	371.2	......	372.0	372.15	372.3	370.7
30.....	370.55	370.2	371.15	371.0	370.75	371.1	371.2	......	372.0	372.15	372.2	370.7
31.....	370.5	370.2	......	371.15	......	371.1	371.15	......	371.95	......	372.1	......

ONEIDA RIVER AT LOCK No. 23, NEAR BREWERTON

Gages Nos. 405 and 406

A new station, gage No. 405, was established on December 6, 1917, above lock No. 23, about 2½ miles west of the village of Brewerton. A standard staff gage, graduated to feet and tenths, is located on the upper north approach wall of the lock, just above the gate recess. It has a range of eight feet, between elevations 368.0 and 376.0.

A new station, gage No. 406, was also established December 6, 1917, below lock No. 23. A standard staff gage, graduated to feet and tenths, was placed on the return wall, just west of the power-house. It has a range of eight feet, between elevations 362.0 and 370.0 (B. C. datum).

The gages were read twice daily — about 6 A. M. and 6 P. M.— to tenths.

The bench-mark for both gages is a brass plug set in the south wall of the lock near the third snubbing post east of west gates at elevtion 377.067 (B. C. datum).

Daily elevation of water-surface (B. C. datum) of ONEIDA RIVER ABOVE LOCK No. 23, NEAR BREWERTON, for the year ended June 30, 1919. Wm. M. Persing, Observer

DAY	June	DAY	June	DAY	June
16	......	21	370.8	26	370.8
17	370.8	22	370.8	27	370.7
18	370.85	23	370.75	28	370.65
19	370.85	24	370.7	29	370.7
20	370.85	25	370.75	30	370.6

NOTE.— Readings begun June 17, 1919.

Daily elevations of water-surface (B. C. datum) of ONEIDA RIVER BELOW LOCK No. 23, NEAR BREWERTON, for the year ended June 30, 1919. Wm. M. Persing, Observer

DAY	JUNE	DAY	June	DAY	June
16	......	21	363.85	26	363.9
17	364.1	22	363.85	27	363.8
18	364.02	23	363.9	28	363.9
19	364.05	24	364.05	29	364.0
20	363.95	25	363.95	30	363.9

NOTE.— Readings begun June 17, 1919.

ONEIDA RIVER AT CAUGHDENOY

Gages Nos. 183 and 184

Location.— At the Caughdenoy dam on the Oneida river about 600 feet above the highway bridge at Caughdenoy and about 4 miles below Oneida lake.

Drainage area.— 1,377 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— Water-surface elevations, April 22, 1904, to June 30, 1919. Discharge, January 1, 1910, to June 30, 1918. Dam completed during summer of 1909.

Gages.— Upper gage: On July 20, 1916, the staff on tree on right bank about 50 feet above dam was superseded by a standard Type A gage, No. 184, and by a slope gage on the bank. The standard gage is secured to the same tree and has a range of 8 feet, between elevations 366.0 and 374.0. The slope gage on the bank a short distance upstream has a range of 5 feet, between elevations 372.0 and 377.0. The gage bench-mark is a nail in last tree in row on north side of highway opposite northeast monument and is at elevation of 389.424 (B. C. datum).

Lower gage: On July 19, 1916, the staff gage on pile below old lock was superseded by a standard Type A gage. This gage, No. 183, is secured to the west end of concrete retaining wall below lower south approach wall to Caughdenoy lock, and has a range of 12 feet, between elevations 362.0 and 374.0. A standard bench-mark plug is set in the face of the wall near the gage at elevation 368.0 (B. C. datum).

These gages are read once daily — about 11 A. M.— the upper one to half-tenths, the lower one to tenths.

Discharge computations.— Flow over dam computed, using coefficient derived from U. S. Geological Survey experiments, submergence from U. S. Deep Waterways experiments. Flow through gate and diversion through lock culverts estimated by theoretical calculations.

Control.— Concrete dam with straight ogee type crest 415 feet long at elevation 369.63 and a vertical lift-gate with clear span of 30 feet 9 inches and sill at elevation 362.73.

Extremes of discharge. — 1910–1919: Maximum discharge recorded, March 30, 1913, 11,100 second-feet. Minimum discharge recorded, January 9, and March 13 and 14, 1914, zero

second-feet, water below crest of dam and no reported diversion.

Diversion.— From the southern portion of this drainage basin, principally on Chittenango, Butternut, Oneida and Limestone creeks, there is storage and diversion for the water-supply of the old Erie canal. From the Black and Mohawk river basins there is diversion into this drainage area via the summit levels of the old Erie and new Barge canal.

Regulation.— By storage indicated under diversion and by Oneida lake surface of 78 square miles.

Accuracy.— Estimated flow within ten per cent. There are occasional short periods, which can not now be definitely determined, for which the estimated discharge previously published is too large, due to the use of a water-surface elevation incorrectly reported one foot too high.

Daily elevation of water-surface (B. C. datum) of ONEIDA RIVER ABOVE DAM AT CAUGHDENOY, for the year ended June 30, 1919. Mrs. J. R. Hiller and John P. Patterson, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	370.4	370.4	369.95	370.7	370.7	370.3	370.8	370.85	370.6	371.2	371.4	371.25
2	370.1	370.3	370.1	370.7	370.6	370.5	370.9	370.7	370.7	371.25	371.3	371.2
3	370.2	370.25	370.2	370.65	370.8	370.25	370.9	370.8	370 75	371.15	371.3	371.1
4	370.35	370.3	369.9	370.7	370.85	370.2	371.0	370.8	370.75	371.15	371.4	371.0
5	370.35	370.1	370.0	370.65	370.8	370.2	370.9	370.7	370.75	371.3	371.3	371.0
6	370.25	370.1	370.0	370.85	370.9	370.5	370.9	370.75	370.8	371.3	371 4	370.9
7	370.25	370.15	370.0	370.7	370.8	370.2	370.9	370.7	370.9	371.3	371.4	370.9
8	370.15	370.25	370.1	370.8	370.7	370.1	370.9	370.7	370.85	371.4	371.3	370.9
9	370.25	370.25	370.0	370.85	370.8	370.1	370.85	370.65	370.9	371.45	371.3	370.9
10	370.3	370.45	370.0	370.8	370.5	370.2	370.9	370.6	370.9	371.5	371.3	370.9
11	370.3	370.4	370.2	370.6	370.65	370.45	370.8	370.65	371.0	371.5	371.35	370.8
12	370.3	370.35	370.1	370.55	370.6	370.1	370.8	370.6	371.1	371.6	371.3	370.9
13	370.3	370.35	370.1	370.5	370.55	370.25	370.8	370.6	371.1	371.8	371.35	370.85
14	370.25	370.25	370.0	370.5	370.5	370.3	370.75	370.7	371.1	371.8	371.4	370.8
15	370 5	370.25	370.2	370.45	370.5	370.4	370.7	370.6	371.2	371.85	371.4	370.7
16	370.5	370.2	370.0	370.4	370.45	370.5	370.7	370.6	371.2	372.0	371.3	370.7
17	370.45	370.2	370.2	370.4	370.5	370.6	370.7	370.6	371.2	371.8	371.3	370.7
18	370.45	370.2	370.4	370.35	370.4	370.55	370.75	370.6	371.15	371.65	371.25	370.7
19	370.45	370.2	370.3	370.35	370.4	370.55	370.6	370.6	371.25	371.65	371.35	370.65
20	370.45	370.1	370.45	370.3	370.5	370.55	370.7	370.6	371.3	371.6	371.5	370.5
21	370.5	370.15	370.45	370.35	370.5	370.5	370.7	370.7	371.3	371.55	371.4	370.6
22	370.45	370.0	370.4	370.4	370.5	370.5	370.7	370.65	371.3	371.5	371.4	370.6
23	370.45	370.1	370.5	370.4	370.4	370.5	370.75	370.6	371.3	371.5	371.4	370.6
24	370.5	370.0	370.5	370.3	370.5	370.7	370.6	370.55	371.45	371.4	371.45	370.5
25	370.45	370.15	370.8	370.4	370.25	370.7	370.8	370.6	371.4	371.2	371.45	370.3
26	370.4	370.15	370.7	370.45	370.45	370.7	370.8	3 0.6	371.3	371.3	371.45	370.6
27	370.45	370.1	370.7	370. 5	370.25	370.7	370.8	370.6	371.25	371.85	371.45	370.5
28	370.4	370 0	370.7	370.7	370.5	370.7	370.9	370.65	371.1	371.85	371.4	370.5
29	370.4	370.0	370.6	370.6	370.2	370.7	370.8	......	371.0	371.2	371.35	370.5
30	370.3	370.0	370.7	370.5	370.2	370.6	370.85	......	371.2	371.3	371.3	370.45
31	370.35	370.0	......	370.65	......	370.8	370.85	......	371.25	......	371.3	......

Daily elevation of water-surface (B. C. datum) of ONEIDA RIVER BELOW DAM AT CAUGHDENOY, for the year ended June 30, 1919. Mrs. J. R. Hiller and John P. Patterson, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	364.4	364.0	363.4	364.6	365.2	364.4	364.6	364.7	364.6	366.2	366.6	366.4
2.....	363.9	363.9	363.7	364.6	365.2	364.7	364.9	364.6	364.7	365.9	366.9	366.2
3.....	364.1	363.8	363.7	364.5	365.	364.5	365.0	364.6	364.9	366.1	366.8	366.1
4.....	364.0	363.9	363.6	364.6	365.6	364.3	365.1	364.7	364.9	366.2	366.8	365.9
5.....	364.0	363.9	363.6	364.7	365.7	364.3	365.5	364.7	365.0	366.3	366.5	365.7
6.....	363.9	363.8	363.5	364.8	365.6	364.5	365.2	364.7	365.0	365.9	366.6	365.6
7.....	363.8	363.8	363.5	364.7	365.5	364.6	364.9	364.7	365.0	366.0	366.6	365.6
8.....	363.7	363.9	363.5	364.8	365.5	364.4	364.9	364.7	364.9	366.0	366.5	365.6
9.....	363.8	363.9	363.6	364.8	365.3	364.3	364.8	364.6	365.2	366.2	366.4	365.6
10.....	363.9	364.1	363.5	364.7	364.9	364.4	365.2	364.5	365.5	366.4	366.7	365.6
11.....	364.0	364.1	363.7	364.8	365.0	364.6	364.9	364.5	365.7	366.5	366.7	365.6
12.....	364.0	364.1	363.6	364.9	365.9	364.4	365.0	364.4	365.7	367.1	366.7	365.0
13.....	364.0	364.1	363.7	364.8	364.7	364.6	365.1	364.3	365.7	367.4	366.8	364.8
14.....	364.0	363.9	363.7	364.7	364 4	364 7	365.0	364.5	365.7	367.6	366.9	364.7
15.....	364.1	363.9	363.8	364.6	364.7	364.8	364.9	364.5	365 6	367.4	366.7	364.7
16.....	364.1	363.8	364.0	364.6	364.6	365.0	364.8	364.4	365.6	367.8	366.5	364.7
17.....	364.2	363.7	364.0	364.[illegible]	364.8	365.0	364.7	364.5	365.7	367.2	366.5	364.7
18.....	364.2	363.7	364.4	364.5	364.8	365.1	364.7	364.4	365.8	367.3	366.4	364 6
19.....	364.1	363.8	364.1	364.5	364.8	364.9	364.6	364.3	366.0	367.2	366.6	364.5
20.....	364.1	363.7	364.5	364.5	364.9	364.9	364.6	364.3	366.1	367.2	366.8	364.4
21.....	364.1	363.7	364.4	364.4	364.8	364.9	364.6	364.3	366.0	367.1	366.8	364.3
22.....	364.1	363.6	364.6	364.5	364.6	364.9	364.6	364.3	366.0	367.0	366.8	364.2
23.....	364.1	363.7	364.6	364.6	364.6	364.9	364.6	364.3	365.9	366.9	366.9	364.3
24.....	364.1	363.5	364	364.5	364.6	365.2	364.7	364.4	365.9	366.6	367.0	364.3
25.....	364.1	363.5	364.8	364 5	364.5	365.3	364.9	364.6	366.0	366.5	367.0	364.3
26.....	364.1	363.6	364.7	364.8	364.5	365.3	364.9	364.6	366.2	366.5	367.1	364.2
27.....	364.2	363.6	364.7	364.9	364.4	365.4	364.9	364.6	366.2	366.6	367.1	364.0
28.....	364.2	363.5	364.	365 0	364.9	365.4	364.9	364.5	365.9	366.7	366.9	364.1
29.....	364.3	363.5	364.6	365.0	364.5	365.3	364.9	......	365.8	366.6	366.7	364 3
30.....	364.1	363.4	364.7	364.9	364.3	365.3	364.9	......	366.3	366.6	366.6	364.2
31.....	364.1	363.4	......	365.1	......	364.8	364.7	......	366.3	......	366.5	......

Daily discharge, in second-feet, of ONEIDA RIVER AT CAUGHDENOY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	2,195	976	281	1,632	3,546	2,759	2,262	2,394	1,793	2,880	4,643	4,201
2.....	1,684	797	489	1,632	3,300	3,213	2,513	2,022	2,012	3,030	4,293	4,063
3.....	602	710	624	1,522	3,820	2,832	2,512	2,264	2,132	2,740	4,309	3,775
4.....	874	801	218	1,628	3,959	2,846	2,784	2,265	2,136	2,910	4,617	3,526
5.....	870	473	337	1,518	3,798	2,609	2,512	2,022	2,135	3,500	4,341	3,553
6.....	686	477	343	2,002	4,085	3,254	2,515	2,140	2,255	3,180	4,641	3,271
7.....	702	549	343	1,630	3,810	2,641	2,515	2,018	2,508	3,180	4,645	3,279
8.....	527	700	469	1,870	3,539	2,661	2,515	2,015	2,389	3,480	4,341	3,283
9.....	694	708	337	1,998	3,811	2,663	2,395	1,905	2,512	3,640	4,357	2,691
10.....	789	1,070	335	1,866	3,060	2,839	2,513	1,794	2,512	3,800	4,317	2,080
11.....	779	986	636	3,279	3,419	3,372	2,260	1,905	2,772	3,800	4,473	1,828
12.....	779	878	461	3,161	3,250	2,656	2,259	1,793	3,045	4,120	4,323	2,078
13.....	785	898	461	3,039	3,192	2,937	2,258	1,794	3,052	4,780	4,463	1,956
14.....	708	702	349	3,035	3,098	3,028	2,135	2,013	3,055	4,780	4,613	1,848
15.....	1,156	708	612	2,933	3,067	2,822	2,017	1,792	3,335	4,950	4,637	1,606
16.....	1,162	628	335	2,816	2,961	3,267	2,017	1,794	3,335	5,540	4,351	1,594
17.....	1,050	628	618	2,812	3,055	3,660	2,015	1,795	3,339	5,945	4,351	1,594
18.....	1,060	630	964	2,710	2,834	3,530	2,133	1,802	3,194	5,413	4,205	1,596
19.....	1,054	624	791	2,706	2,830	3,541	1,794	1,805	3,492	5,425	4,501	1,488
20.....	1,066	467	1,060	2,605	3,052	3,539	2,014	1,808	3,645	5,259	4,955	1,154

Daily discharge in second-feet, of ONEIDA RIVER AT CAUGHDENOY, for the year ended June 30, 1919 — *Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
21	1,162	545	1,068	2,725	3,053	3,414	2,013	2,029	3,647	5 105	4,621	1,384
22	1,056	349	972	2,814	3,072	3,416	2,012	1,922	3,650	4,951	4,617	1,394
23	1,056	473	1,168	2,818	2,832	3,417	2,135	1,805	3,652	4,967	4,615	1,370
24	1,168	345	1,156	2,609	3,064	3,907	1,797	1,690	4,110	4,667	4,765	1,158
25	1,060	557	1 842	2,808	2,553	3,889	2,259	1,793	3,695	4,055	4,769	775
26	966	543	1,602	2,909	2,965	3,896	2,261	1,793	3,180	4,367	4,751	1,372
27	1,056	473	1,606	2,939	2,523	3,912	2,262	1,794	3,030	6,189	4,757	1,150
28	966	343	1,600	3,536	3,056	3,914	2,512	1,903	2,600	6,180	4,605	1,162
29	962	341	1,382	3,271	2,446	3,896	2,264	......	2,330	4,043	4,479	1,172
30	779	339	1,596	3,033	2,421	3,673	2,394	......	2,880	4,359	4,351	1,056
31	872	349	......	3,397	......	2,260	2,394	......	3,030	......	4,349	......
Mean	978	615	802	2,557	3,182	3,234	2,266	1,924	2,918	4,374	4.518	2,082

Monthly discharge of ONEIDA RIVER AT CAUGHDENOY, for the year ended June 30, 1919

[Drainage area, 1,377 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	2,195	527	978	0.710	0.819
August	1,070	339	615	0.447	0.515
September	1,842	218	803	0.582	0.649
October	3,536	1,518	2,557	1.857	2.141
November	4,085	2,421	3,182	2.311	2.578
December	3,914	2,260	3,234	2.348	2.707
January	2,784	1,794	2,266	1.646	1.898
February	2,394	1,690	1,924	1.397	1.455
March	4,110	1,793	2,918	2.119	2.443
April	6,189	2,740	4,374	3.176	3.544
May	4,955	4,205	4,518	3.281	3.782
June	4,201	775	2,082	1.512	1.687
The year	6,189	218	2,454	1.782	24.218

ONEIDA RIVER AT OAK ORCHARD

Gage No. 182

This station is located on the Oak Orchard highway bridge, also known as Schroeppel's bridge, across the Oneida river at Oak Orchard, about 7⅝ miles upstream from the junction of the Oneida and Seneca rivers. It was established April 23, 1904, just below the old lock at the Oak Orchard dam and then indicated the water-surface below the dam. On August 1, 1915, the gage was moved to the lower end of the south side of the old pier near the south, or left bank. The bridge is about ⅓ mile below the site of the old dam, which has been removed in connection

with the canalization of the Oneida river for the Barge canal. Previous to 1914 this record was published as "below dam."

On July 18, 1916, the staff gage was replaced by a standard Type A gage, No. 182, in the same location, having a range of 12 feet, between elevations 361.0 and 373.0. The gage bench-mark is on the northeast corner of south abutment of Schroeppel's bridge and is at elevation 370.489 (B. C. datum).

The gage is read once daily — A. M. — to quarter-tenths.

Daily elevation of water-surface (B. C. datum) of ONEIDA RIVER AT OAK ORCHARD, for the year ended June 30, 1919. LaRue Sitterly, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	363.85	363.95	363.45	364.60	364.42	364.12	364.25	364.20	304.22	364.85	365.35	365.05
2	363.68	363.88	363.52	364.58	364.45	364.22	364.22	364.18	364.32	364.82	365.55	365.00
3	363.72	363.82	363.52	364.55	364.50	364.15	364.28	364.15	364.42	364.80	365.38	364.75
4	363.80	363.78	363.50	364.50	364.42	364.05	364.30	364.12	364.42	364.90	365.28	364.40
5	363.85	363.92	363.50	364.40	364.38	364.05	364.30	364.15	364.45	365.05	365.10	364.38
6	363.85	363.85	363.52	364.25	364.38	364.02	364.30	364.20	364.48	364.98	365.20	364.25
7	363.85	363.80	363.48	364.22	364.32	364.00	364.32	364.22	364.48	364.88	365.22	364.28
8	363.62	363.82	363.50	364.20	364.22	364.02	364.32	364.28	364.48	364.90	365.22	364.40
9	363.65	363.82	363.52	364.15	364.15	364.05	364.32	364.25	364.50	364.95	365.25	364.42
10	363.70	363.80	363.52	364.08	364.05	364.10	364.32	364.28	364.60	364.98	365.50	364.30
11	363.85	363.80	363.52	363.98	364.12	364.20	364.35	364.20	364.98	365.02	365.25	364.50
12	363.92	363.80	363.55	364.30	364.20	364.28	364.38	364.20	365.00	365.82	365.28	364.40
13	363.88	363.78	363.70	364.30	364.08	364.32	364.38	364.22	364.90	365.95	365.52	364.20
14	363.90	363.75	363.72	364.25	364.12	364.40	364.38	364.25	364.80	366.02	365.65	364.10
15	363.95	363.70	363.80	364.08	364.18	364.40	364.35	364.28	364.82	365.90	365.38	364.05
16	363.88	363.65	363.85	364.05	364.22	364.05	364.35	364.22	364.82	365.90	365.22	364.05
17	363.90	363.60	363.90	364.05	364.22	364.15	364.35	364.18	364.80	366.48	365.20	364.08
18	363.88	363.60	363.95	364.02	364.20	364.20	364.35	364.00	364.90	365.68	365.15	364.08
19	363.85	363.60	364.05	364.02	364.20	364.28	364.32	363.92	364.85	365.28	365.05	364.10
20	363.85	363.62	364.20	364.02	364.18	364.28	364.32	363.85	364.72	365.25	365.10	364.02
21	363.85	363.62	364.62	364.02	364.18	364.28	364.32	363.75	364.68	365.15	365.22	363.95
22	363.88	363.58	364.68	364.05	364.15	364.22	364.30	363.70	364.65	365.30	365.28	363.90
23	363.90	363.52	364.72	364.10	364.12	304.20	364.30	363.80	364.52	365.30	365.42	363.85
24	363.92	363.45	364.70	364.10	364.12	364.35	364.30	363.95	364.60	365.28	365.50	363.85
25	363.98	363.48	364.65	364.05	364.12	364.50	364.28	364.15	364.70	365.25	365.72	363.85
26	364.02	363.50	364.70	364.35	364.15	364.45	364.28	364.15	364.75	365.25	365.70	363.85
27	364.00	363.50	364.75	364.32	364.12	364.42	364.28	364.18	364.82	365.25	365.72	363.85
28	364.02	363.48	364.80	364.30	364.10	364.32	364.28	364.20	364.78	365.28	365.60	363.80
29	364.10	363.42	364.78	364.28	364.05	364.25	364.25	......	364.82	365.30	365.35	363.85
30	364.02	363.38	364.70	364.25	364.10	364.25	364.25	......	364.90	365.32	365.20	363.90
31	363.98	363.42	......	364.45	......	364.25	364.20	......	364.85	......	365.10	......

ONEIDA RIVER AT THREE RIVER POINT

Gage No. 181

This station, located at Three River Point, the junction of Seneca and Oneida rivers, which form the Oswego river, was established April 16, 1904. On July 17, 1916, the staff gage on the upstream end of the most northerly pier of the temporary tow-path bridge over Oneida river was superseded by a standard Type A gage, No. 181, in two sections. The lower section is

secured to the south face of east end of boat landing of Three River dock, and has a range of 4 feet, between elevations 360.0 and 364.0. The upper section is secured to the west wing wall of south abutment of the highway bridge over Oneida river, and has a range of 8 feet, between elevations 364.0 and 372.0. A standard bench-mark plug is set in the face of the wall near the upper section at elevation 368.0 (B. C. datum).

The gage is read once daily — A. M.— to tenths.

Daily elevation of water-surface (B. C. datum) of ONEIDA RIVER AT THREE RIVER POINT, for the year ended June 30, 1919. Fred Chamberlain, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	363.85	363.70	363.30	364.10	364.15	363.80	363.80	363.90	364.00	364.55	364.95	364.70
2.....	363.60	363.60	363.50	364.00	364.10	364.10	364.10	363.88	364.20	364.55	365.15	364.65
3.....	363.70	363.65	363.55	364.00	364.20	363.90	364.10	363.88	364.35	364.55	364.90	364.40
4.....	363.80	363.70	363.55	363.90	364.25	363.90	364.05	363.98	364.35	364.65	364.70	364.15
5.....	363.80	363.75	363.50	364.00	364.15	363.80	363.88	364.00	364.30	364.90	364.65	363.90
6.....	363.75	363.80	363.50	364.10	364.05	363.85	364.05	363.95	364.35	364.70	364.75	363.95
7.....	363.80	363.70	363.40	364.20	364.05	363.90	363.90	364.20	364.25	364.70	364.70	364.00
8.....	363.60	363.70	363.45	364.15	363.95	363.85	363.92	364.25	364.20	364.60	364.60	364.30
9.....	363.60	363.80	363.70	364.05	363.90	363.95	363.95	364.10	364.35	364.80	364.40	364.30
10.....	363.70	363.80	363.50	364.00	363.90	363.95	363.90	364.00	364.80	364.85	364.65	364.20
11.....	363.85	363.75	363.45	363.90	363.90	363.95	363.85	363.90	364.90	364.95	364.85	364.40
12.....	363.90	364.00	363.55	364.15	364.00	363.98	364.10	363.90	364.80	365.40	364.85	364.30
13.....	363.85	363.85	363.65	364.20	363.90	363.95	364.25	363.80	364.60	365.65	365.10	364.15
14.....	363.85	363.75	363.65	364.05	363.70	364.22	364.30	364.10	364.65	365.60	365.10	364.00
15.....	363.75	363.65	363.65	363.90	364.00	364.20	364.20	364.10	364.55	365.40	364.90	364.10
16.....	363.80	363.65	363.85	363.95	364.10	364.22	364.10	363.90	364.45	365.15	364.75	364.05
17.....	363.75	363.50	363.80	364.00	364.10	364.20	364.15	364.00	364.60	364.95	364.60	364.10
18.....	363.75	363.60	363.85	363.90	364.22	364.10	364.15	363.90	364.75	364.80	364.65	364.20
19.....	363.75	363.70	363.90	363.90	364.15	364.00	364.10	363.90	364.95	364.70	364.65	364.20
20.....	363.80	363.60	364.10	363.95	364.10	363.95	363.95	363.80	365.00	364.65	364.75	363.90
21.....	363.80	363.60	364.15	364.00	364.00	364.00	363.98	363.75	365.00	364.60	364.70	363.80
22.....	364.00	363.60	364.25	363.95	363.85	363.98	364.00	363.70	364.80	364.85	364.65	363.80
23.....	363.85	363.50	364.15	363.90	363.95	364.00	364.00	363.75	364.70	364.90	365.00	363.95
24.....	363.90	363.40	364.10	363.95	363.95	364.20	364.20	364.00	364.65	364.90	365.05	364.05
25.....	363.95	363.35	364.10	363.90	363.90	364.30	364.15	364.10	364.60	364.75	365.30	363.95
26.....	363.95	363.50	364.10	364.10	363.90	364.25	364.15	364.15	364.60	364.88	365.30	363.80
27.....	363.90	363.50	364.20	364.20	363.95	364.15	364.10	364.10	365.60	365.00	365.30	363.75
28.....	363.90	363.50	364.25	364.00	363.95	364.00	364.05	364.00	365.45	364.85	365.15	363.90
29.....	364.05	363.40	364.20	364.05	363.90	363.95	364.05	......	364.00	364.85	364.90	364.00
30.....	363.85	363.30	364.10	364.00	363.80	363.85	364.00	......	364.65	364.95	364.75	363.90
31.....	363.90	363.25	......	364.10	......	363.85	363.95	......	364.65	......	364.65	......

ONEIDA LAKE

Oneida lake, with a water-surface of 78 square miles, is about 20¾ miles long and 4 to 5 miles wide the greater part of its length. Its depth varies from 20 to 50 feet, but there are several shoals. The total drainage area above its outlet is 1,353 square miles, of which the lake surface constitutes five and three-quarters

per cent. The drainage basin within a radius of 10 miles to the south and west is relatively flat, with numerous swampy tracts. The lake receives, through Chittenango and Oneida creeks, drainage from an extensive area of the central New York plateau and, through Wood and Fish creeks on the east, drainage from a portion of the west slope of the plateau bordering the Adirondack mountains. On the north the drainage area is less extensive and the inflowing streams are small.

The Barge canal traverses the length of the lake. A low navigable surface is maintained at elevation 369.9 by the Caughdenoy dam 4 miles down the Oneida river, a description of which is given under the Oneida river.

For elevation of west end of Oneida lake see Oneida river at Brewerton.

The following table gives the elevations of extreme high and low-water surface each year of Oneida lake as indicated by gages at Brewerton at the west and Sylvan Beach at the east end of the lake. The gage at Brewerton is about 1,500 feet down the outlet, while that at Sylvan Beach is about 800 feet up Fish creek from the lake. The difference between extreme surface at each end of the lake is probably mainly due to wind, supplemented by such slight slope between the gage and lake as may occur during times of large flow.

Annual high and low water-surface elevation of ONEIDA LAKE

YEAR	BREWERTON			SYLVAN BEACH		
	SURFACE ELEVATION		Range	SURFACE ELEVATION		Range
	High	Low		High	Low	
			Feet			Feet
1904	374.0	369.1	4.9	....	....	....
1905	374.9	369.9	5.0	375.4	370.5	4.9
1906	372.8	368.7	4.1	373.1	368.9	4.2
1907	372.9	369.1	3.8	373.1	369.2	3.9
1908	373.4	368.6	4.8	373.7	368.5	5.2
1909	374.5	370.0	4.5	374.5	369.8	4.7
1910	373.9	369.1	4.8	374.0	370.0	4.0
1911	374.2	370.2	4.0	374.3	369.7	4.6
1912	375.3	370.2	5.1	376.9	370.0	6.9
1913	375.3	369.6	5.7	377.0	369.3	7.7
1914	374.2	369.7	4.5	375.8	369.8	6.0
1915	372.5	369.5	3.0	372.4	369.5	2.9
1916	374.0	369.3	4.7	374.0	369.9	4.1
1917	374.5	369.0	5.5	374.2	369.1	5.1
1918	373.25	370.1	3.15	373.0	369.6	3.4

ONEIDA LAKE AT SYLVAN BEACH

Gage No. 186

This station, established July 1, 1904, is located at the east end of Oneida lake, at Sylvan Beach. A staff gage, attached to the corner of the crib dock on the right, or north bank of canalized Fish creek, just above, or east of Railroad street bridge and about 800 feet from the lake, was in use until May 31, 1917. On May 31, 1917, a standard Type A gage, No. 186, in two sections, was erected in practically the same location. The lower section has a range of 8 feet, between elevations 367.0 and 375.0. The upper section is secured to the north face of the north abutment of the Sylvan Beach bridge and has a range of 4 feet, between elevations 373.0 and 377.0. The gage benchmark is a wooden plug in top of north abutment, Sylvan Beach bridge, between piers, and is at elevation of 377.0 (B. C. datum).

The gage was read twice daily — at 9 A. M. and 2 P. M. — during July, to tenths; once daily thereafter, to tenths and half-tenths.

Daily elevation of water-surface (B. C. datum) of ONEIDA LAKE AT SYLVAN BEACH, for the year ended June 30, 1919. Wm. H. Dunn and L. A. Withey, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	371.4	370.4	370.2	371.05	371.3	370.65	371.15	371.25	370.9	372.05	372.05	372.0
2	371.5	370.45	370.1	371.05	371.4	370.6	371.25	371.2	371.05	372.0	372.35	371.85
3	371.6	370.45	369.95	371.15	371.4	370.55	371.35	371.15	371.1	371.9	372.55	371.8
4	371.6	370.35	370.05	371.05	371.35	370.6	371.5	371.1	371.05	371.9	372.4	371.75
5	371.4	370.3	370.1	371.0	371.4	370.6	371.45	371.1	371.15	371.85	372.5	371.6
6	371.3	370.3	370.2	371.0	371.3	370.55	371.35	371.05	371.25	371.9	372.3	371.5
7	371.2	370.3	370.1	371.05	371.25	370.45	371.3	371.0	371.25	372.1	372.2	371.45
8	371.2	370.35	370.15	371.1	371.2	370.4	371.3	371.0	371.25	372.1	372.2	371.3
9	371.3	370.5	370.1	371.1	371.1	370.45	371.25	370.95	371.25	372.15	372.05	371.25
10	371.4	370.35	370.15	371.1	371.25	370.4	371.25	370.9	371.45	372.2	371.85	371.2
11	371.4	370.45	369.95	371.1	371.05	370.4	371.25	370.85	371.65	372.4	372.05	371.15
12	371.4	370.5	370.05	371.05	371.0	370.4	371.2	370.8	371.65	372.65	372.2	371.05
13	371.5	370.5	370.3	371.0	370.85	370.45	371.15	370.8	371.7	373.45	372.25	371.05
14	371.4	370.55	370.2	370.9	370.9	370.45	371.1	370.8	371.7	373.1	372.35	371.05
15	371.3	370.5	370.1	370.8	370.8	370.75	371.05	370.85	371.65	373.05	372.2	371.0
16	371.0	370.45	370.15	370.7	370.65	370.9	371.05	370.95	371.75	372.85	372.1	371.0
17	370.9	370.35	370.5	370.65	370.6	370.95	371.0	370.95	371.7	373.0	372.05	371.0
18	370.9	370.3	370.45	370.65	370.75	371.0	371.0	370.95	371.8	372.95	372.15	370.95
19	370.8	370.25	370.55	370.6	370.85	370.9	371.0	370.9	371.9	372.9	372.3	370.9
20	370.8	370.25	370.7	370.6	370.9	370.85	370.95	370.9	372.0	372.8	372.25	370.9
21	370.7	370.2	370.95	370.7	371.0	370.8	370.95	370.85	372.1	372.75	372.2	370.9
22	370.7	370.25	371.05	370.65	371.0	370.85	370.9	370.8	372.1	372.6	372.15	370.9
23	370.8	370.2	370.9	370.65	371.2	371.05	370.9	370.8	372.15	372.45	372.35	370.8
24	370.8	370.25	371.1	370.55	371.1	371.0	371.05	370.8	372.15	372.7	372.4	370.75
25	370.7	370.25	371.05	370.6	371.0	371.1	371.15	370.85	372.1	372.6	372.5	370.7
26	370.6	370.25	371.05	370.75	370.85	371.35	371.25	370.9	372.05	372.55	372.5	370.7
27	370.6	370.2	371.2	370.9	370.7	371.3	371.25	370.9	372.0	372.35	373.5	370.75
28	370.5	370.0	371.1	371.15	370.6	371.25	371.25	370.85	372.35	372.25	372.4	370.7
29	370.5	370.15	371.25	371.0	370.85	371.25	371.3	......	372.35	372.3	372.3	370.65
30	370.5	370.15	371.05	371.05	370.9	371.2	371.3	......	372.05	372.15	372.2	370.65
31	370.5	370.2	......	371.2	......	371.2	371.3	......	372.1	......	372.1	......

CHITTENANGO CREEK

DESCRIPTION

Chittenango creek is the principal tributary of Oneida lake from the south. It comprises three main branches, namely, Butternut creek, Limestone creek and Chittenango creek proper. The three branches join near North Manlius. Above the junction with Butternut creek, Chittenango creek flows through an irregular dumb-bell-shaped area extending in a northwest and southeast direction. This area lies chiefly in the dissected, hilly region south of the line of the New York Central railroad. The length of the basin is about 22 miles. Its width in the upper portion is 9 miles; in the middle portion, 4 miles; in the lower portion, 7 miles. The drainage basin is deeply rolling, mostly cleared, and has a heavy, impervious soil with extensive sodded-meadow areas. The soil is underlaid by shale rock, often outcropping, and affording numerous springs. The stream tributaries are somewhat sparse. Marsh and swamp areas are very limited, with the exception of the Nelson swamp, about two square miles in area.

The outflow from Cazenovia lake is regulated and there is also a reservoir at Erieville. These reservoirs are used to supply the summit level of the Erie canal. The capacities of these reservoirs are given as follows in New York State Barge Canal Report for 1901, page 663:

Erieville Reservoir

Storage capacity	318,424,000 cubic feet
Water-surface	340 acres

Cazenovia Lake

Storage capacity	206,997,000 cubic feet
Water-surface	1.7 square miles

The head of the stream is near Erieville reservoir, which is formed by a dam crossing a small stream valley, formerly tributary to Chenango river through Eaton brook. Cazenovia lake is located 10 miles below Erieville reservoir, which is at the head of the stream at elevation 1,190. From its outlet to the foot of the plateau at Erie canal crossing, the stream descends 770 feet, the distance, following the general trend of the valley, being 11 miles. At Chittenango falls there occurs a precipitous descent of about 100 feet.

CHITTENANGO CREEK AT CHITTENANGO

Gage No. 191

This station, established May 22, 1901, is located at the Main street bridge over Chittenango creek at Chittenango. This was originally a discharge station, but since 1911 it has been maintained for water-surface elevation only. A staff gage, secured to the downstream end of the left abutment of the bridge, was used until September 28, 1916, when it was replaced by a standard Type A gage, No. 191, having a range of 8 feet, between elevations 449.0 and 457.0. The gage bench-mark is the top of the concrete coping at angle with wing, east abutment, upstream side of Main street bridge, and is at elevation 458.905 (B. C. datum).

The gage is read twice daily — 7 to 8 A. M. and 4 P. M. — to hundredths.

Daily elevation of water-surface (B. C. datum) of CHITTENANGO CREEK AT CHITTENANGO, for the year ended June 30, 1919. W. S. Siver, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	451.80	451.68	......	......	452.00	451.78	452.08	452.60	452.85	452.25	452.42	452.00
2	451.82	451.60	......	......	451.92	451.82	452.55	452.85	452.12	452.30	452.45	452.00
3	451.72	451.62	......	......	451.82	451.82	452.08	452.80	451.98	451.98	452.30	451.95
4	451.90	451.62	......	......	451.98	451.82	451.92	452.80	452.00	452.45	452.10	451.92
5	451.80	451.64	......	......	452.08	451.72	451.92	452.80	452.04	452.65	452.28	452.00
6	451.72	451.62	......	......	452.00	451.78	451.88	452.80	451.94	452.90	452.30	451.98
7	451.70	451.61	......	......	451.92	451.74	451.88	452.85	451.90	452.92	452.30	451.95
8	451.68	451.65	......	......	451.82	451.80	451.88	452.80	451.79	452.98	452.25	451.92
9	451.78	451.75	......	......	451.75	452.05	451.90	452.85	452.68	452.75	452.18	451.90
10	451.88	451.78	......	......	451.85	451.88	451.95	452.75	452.60	452.80	452.28	451.85
11	451.92	451.65	......	452.00	451.82	451.88	451.82	452.86	452.28	453.05	453.25	451.80
12	451.88	451.60	......	452.00	451.78	451.82	451.98	452.65	452.05	453.20	452.82	451.82
13	451.90	451.59	......	451.75	451.79	451.84	452.00	453.85	452.15	453.18	452.80	451.78
14	451.98	451.61	......	451.78	451.84	452.02	451.82	453.65	451.92	452.82	452.55	451.75
15	452.12	451.58	......	451.80	451.92	452.48	451.84	453.30	452.00	452.68	452.45	451.75
16	451.82	......	......	451.85	451.98	452.20	451.80	452.95	452.35	452.65	452.30	452.20
17	451.82	......	......	451.78	451.91	452.05	451.84	453.35	452.60	452.58	452.55	452.00
18	451.78	......	......	451.78	452.04	451.88	451.86	452.95	452.65	452.58	452.55	451.95
19	451.80	......	......	451.75	451.98	451.82	451.82	452.75	452.25	452.45	452.28	451.82
20	451.72	......	......	451.72	451.88	451.86	451.81	452.65	452.08	452.35	452.20	451.82
21	451.72	......	......	451.78	451.92	451.88	451.79	452.75	452.05	452.38	452.12	451.98
22	451.72	......	......	451.76	451.90	452.00	451.84	452.80	451.98	452.28	452.80	451.80
23	451.68	......	......	451.72	451.96	452.21	452.22	451.85	451.92	452.35	452.85	451.82
24	451.88	......	......	451.72	451.85	452.05	452.55	451.75	452.00	452.18	452.68	451.82
25	451.75	......	......	451.80	451.84	452.35	452.12	451.65	452.00	452.20	452.52	451.80
26	451.78	......	......	451.91	451.78	452.12	452.45	451.75	452.25	452.38	452.36	451.82
27	451.74	......	......	451.78	451.78	452.00	452.46	451.65	452.00	452.62	452.28	451.98
28	451.75	......	......	451.68	451.79	451.98	452.15	451.85	452.10	452.75	452.18	451.95
29	451.75	......	......	451.62	451.88	451.92	451.65	......	452.30	452.70	452.10	451.80
30	451.68	......	......	451.85	451.88	451.88	451.59	......	452.00	452.35	452.00	451.78
31	451.78	......	......	452.55	......	451.82	452.62	......	452.12	......	451.98	......

NOTE.— Gage removed; new bridge under construction, August 16 to October 10.

BUTTERNUT CREEK

DESCRIPTION

The headwaters of Butternut creek lie at elevation 1,700 feet, near the south line of Onondaga county. This stream drains a narrow basin about 24 miles in length and having an average width of about 3 miles. The stream flows in a northerly direction. Jamesville reservoir is located 14 miles below the source at elevation about 640. North of the Erie canal the stream flows out into the flat lands, at elevation about 400, which border Oneida lake for a width of several miles. Butternut creek is joined by Limestone creek near North Manlius at a point about 1½ miles above its junction with Chittenango creek. The Erie canal crosses the stream 4½ miles below Jamesville. Above the Erie canal crossing the slopes are steep and the tributaries are mostly short laterals. Jamesville reservoir has a capacity of 170,000,000 cubic feet. The water-surface area is 252 acres. At a distance of 2.35 miles below Jamesville there is a dam which diverts part of the stream to the Orrville feeder. This feeder is 2.25 miles in length.

BUTTERNUT CREEK AT JAMESVILLE

Location.— At the first bridge over Butternut creek above the head of the Orrville feeder and about 1½ miles below the village of Jamesville.

Drainage area.— 53 square miles.

Records available.— Gage heights, July 25, 1907, to June 30, 1919. Discharge, July 25, 1907, to September 15, 1915, and July 1, 1916, to June 30, 1918.

Gage.— Standard chain gage secured to left abutment of old bridge, read to tenths twice daily — at 8 A. M. and 4 P. M.

Discharge measurements.— Made from downstream side of bridge, and by wading above and below gage.

Discharge computations.— Due to changes in the control in September, 1915, and October, 1916, it has been necessary to establish new rating curves. A curve that applied from July 1 to October 17, 1916, was established from two current-meter measurements and by comparison with previous and subsequent curves. It was found that this curve could not be applied to the period from September, 1915, to July 1, 1916, probably due to changes in the control.

The curve established from measurements made since October 18, 1916, is fairly well defined for gage heights up to 3.6 feet. Above that, the discharge is approximate only.

Control.— Gravel rift 400 feet below gage; changeable. The control was materially raised by deposit of gravel during flood about September 14, 1915. A channel was opened through this gravel rift in October, 1916, to lower the water during repairs to the bridge.

Extremes of discharge.— 1907–1918: Maximum stage recorded, 7.2 feet, January 1, 1917, at 8 A. M. and 4 P. M.; discharge not available. Minimum stage recorded, 0.10 foot, 10 days in June and 10 days in July, 1909; discharge, 2 second-feet.

Regulation.— By the Jamesville reservoir for the water-supply of the Erie canal, capacity 170,000,000 cubic feet, water-surface area 252 acres. Daily flow affected by operation of mill about a mile upstream.

Daily gage height, in feet, of BUTTERNUT CREEK NEAR JAMESVILLE, for the year ended June 30, 1919. Marie Brandt Brown, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	2.75	2.55	2.05	1.8	1.65	1.6	1.35	2.75	2.85	2.9	3.05
2	2.8	2.55	2.0	1.8	1.7	1.55	1.35	2.85	2.75	2.85	3.1
3	2.9	2.7	2.0	1.7	1.7	1.55	1.35	2.85	2.75	2.95	3.05
4	2.85	2.75	1.9	1.7	1.65	1.45	1.45	2.75	2.9	3.0	3.15
5	2.8	2.75	1.9	1.7	1.6	1.5	1.55	2.85	2.95	3.05	3.25
6	2.75	2.7	1.85	1.75	1.65	1.45	1.65	2.85	2.9	3.1	3.2
7	2.9	2.65	1.8	1.7	1.7	1.45	1.65	2.75	2.85	3.25	3.25
8	2.9	2.65	1.7	1.65	1.65	1.45	1.75	2.85	2.85	3.45	3.25
9	2.8	2.65	1.7	1.6	1.65	1.55	1.85	2.95	2.85	3.55	3.25
10	2.75	2.75	1.75	1.65	1.6	1.45	1.85	3.0	2.75	3.85	3.35
11	2.75	2.05	1.8	1.65	1.65	1.5	1.85	3.05	2.75	4.3	3.3
12	2.85	2.05	1.8	1.6	1.65	1.55	1.85	2.95	2.75	4.05	3.35
13	2.85	2.1	1.75	1.65	1.6	1.5	1.95	3.05	2.75	4.1	3.25
14	2.5	2.05	1.8	1.7	1.6	1.45	1.95	3.25	2.85	3.95	3.3
15	2.5	2.1	1.7	1.65	1.6	1.45	2.0	3.25	2.9	3.8	3.4
16	2.55	2.15	1.75	1.6	1.65	1.4	2.1	3.1	3.0	3.6	3.35
17	2.6	2.3	1.7	1.6	1.7	1.4	2.25	3.05	2.9	3.2	3.4
18	2.65	2.35	1.7	1.65	1.65	1.35	2.35	3.0	2.95	3.15	3.3
19	2.55	2.2	1.8	1.65	1.75	1.35	2.45	2.95	2.95	3.1	3.35
20	2.55	2.15	1.8	1.6	1.75	1.45	2.6	3.0	2.85	3.05	3.45
21	2.6	2.1	1.85	1.7	1.75	1.45	2.7	3.05	2.95	3.15	3.45
22	2.6	2.05	1.8	1.75	1.85	1.4	2.85	3.05	2.95	3.05	3.55
23	2.7	2.05	1.8	1.7	1.8	1.45	2.9	3.05	3.0	3.1	3.55
24	2.7	2.05	1.75	1.65	1.7	1.45	2.9	3.05	2.95	3.15	3.5
25	2.65	2.05	1.75	1.65	1.65	1.45	2.85	3.1	2.95	3.25	3.45
26	2.65	2.0	1.8	1.75	1.65	1.4	2.85	2.95	2.9	3.25	3.4
27	2.6	2.05	1.7	1.7	1.7	1.35	2.85	2.85	2.8	3.15	3.35
28	2.7	2.35	1.7	1.65	1.65	1.35	2.9	2.9	2.8	3.1	3.3
29	2.65	2.25	1.7	1.6	1.65	1.35	2.9	......	2.75	3.05	3.3
30	2.7	2.15	1.75	1.7	1.65	1.4	2.85	......	2.85	3.05	3.3
31	2.6	2.05	......	1.65	......	1.35	2.85	......	2.85	......	3.25

NOTE.— Station discontinued May 31, 1919.

LIMESTONE CREEK

DESCRIPTION

The natural source of Limestone creek is on the slope of Tinselor hills near Erieville, Madison county. In the construction of the Chenango canal, Tioughnioga creek was diverted and DeRuyter reservoir receives the drainage tributary to this stream above the point of diversion and also that from additional area tributary to Limestone creek, making a total area above the reservoir outlet of 18.8 square miles. The reservoir has a capacity of 504,468,000 cubic feet and a surface area of about 1.0 square mile. The stored waters are discharged through Limestone creek during the canal navigation season. Water is diverted to a head-race by a dam below Manlius. The head-race is used as a water-power canal to supply several mills at Fayetteville, at which place there is a second diverting dam. A feeder from the diverting dam enters Erie canal 1.2 miles below Fayetteville. Power is also developed on Limestone creek at Manlius and Edwards Falls. The headwaters of Limestone creek are at elevation 1,900 feet. DeRuyter reservoir is at elevation 1,286 feet. The fall of the stream is rapid in the first 3 miles below the reservoir, the elevation at the lower end of this reach at Delphi being 900 feet. From Delphi to Buellville the creek follows a winding course over a flat valley bottom averaging about one-half mile in width. The descent in 8 miles between these points is 150 feet. Between Buellville and Manlius, a distance of 2 miles, a fall of 200 feet occurs. This is mostly concentrated at Edwards Falls. The west, or Watervale branch of Limestone creek joins the main stream below Manlius. The precipitous descent of about 100 feet in a short distance occurs at this branch at Stone Quarry Falls. The drainage basin is shown on the Syracuse, Tully, Chittenango and Cazenovia sheets of the United States Geological Survey topographic maps.

LIMESTONE CREEK AT MANLIUS

Gage No. 195

Location.— At the Wilcox avenue bridge in the village of Manlius and above the entrance of the west, or Watervale branch.

Drainage area.— 67 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— Gage height, July 23, 1907, to May 31, 1919. Discharge, January 1, 1911, to September 30, 1915.

Gage.— Standard chain gage attached to downstream side of bridge, read once daily to tenths.

Control.— Rapids about 600 feet below the gage, gravel and boulders, fairly permanent.

Extremes of discharge.— 1911–1918: Maximum stage recorded, 7.6 feet, June 11, 1917, at 5 A. M.; discharge not available. Minimum stage recorded, 1.90 feet, August 23, 1913; discharge, 6 second-feet.

Diversion.— Tioughnioga creek, a tributary of the Susquehanna, is diverted to the DeRuyter reservoir and this territory above the point of diversion is included in the discharge area given above.

Regulation.— Seasonal by DeRuyter reservoir, daily by hydro-electric plant 1 mile upstream.

Daily gage height, in feet, of LIMESTONE CREEK AT MANLIUS, for the year ended June 30, 1919. J. R. Bixby, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	3.0	2.5	3.5	3.0	3.2	3.0	3.8	3.2	3.5	3.8	3.6
2	3.2	2.5	3.2	3.2	3.0	3.0	3.0	3.2	3.2	4.0	3.3
3	3.2	2.7	3.0	3.2	3.2	2.8	2.7	3.0	3.2	4.2	3.4
4	3.0	2.5	3.0	3.0	3.0	3.0	2.7	2.8	2.7	3.6	3.9
5	3.2	2.5	3.2	3.2	3.2	3.0	2.5	2.9	2.6	3.6	3.4
6	*a*	2.7	3.0	3.2	3.0	3.0	2.4	3.0	2.6	3.6	3.0
7	2.7	3.0	3.0	3.2	3.0	3.2	2.4	2.6	2.8	3.4	3.0
8	3.0	3.2	2.7	3.2	3.0	3.5	2.6	2.6	3.5	3.0	3.6
9	3.2	3.0	3.0	3.0	3.3	3.2	2.4	2.6	3.7	4.0	4.0
10	3.0	3.2	3.0	2.8	3.2	3.2	2.4	2.4	4.0	4.2	4.5
11	3.0	3.2	3.3	2.7	3.0	3.0	2.4	2.4	3.6	4.8	4.6
12	3.0	3.2	3.0	2.7	3.0	3.2	2.4	2.6	3.6	3.7	4.0
13	3.2	2.8	2.8	2.7	3.2	3.5	2.4	2.6	3.0	3.8	3.6
14	3.5	3.0	3.0	2.8	2.7	4.2	2.4	3.4	3.0	3.6	3.6
15	3.2	2.7	2.85	3.0	2.6	4.0	2.6	3.6	3.0	3.6	3.0
16	3.0	2.5	3.0	3.0	3.3	4.0	2.4	3.2	3.6	3.8	3.4
17	3.5	2.5	3.2	2.7	2.6	3.8	2.5	3.1	4.2	3.6	4.0
18	3.0	2.5	3.5	2.7	3.5	3.0	2.6	3.0	3.4	3.6	3.3
19	3.0	3.0	3.0	2.6	3.2	3.0	2.7	2.6	3.0	3.0	3.5
20	2.8	2.7	3.0	3.0	3.6	3.0	3.0	2.6	3.0	3.3	4.0
21	3.0	2.5	3.2	3.5	3.2	3.2	3.6	2.4	3.0	3.4	4.6
22	3.2	2.5	3.2	3.0	3.2	3.2	3.8	3.7	3.0	3.0	4.0
23	3.0	2.5	3.0	2.7	3.2	3.0	4.2	3.3	3.0	2.6	3.6
24	2.7	3.0	3.7	2.5	3.2	3.0	3.6	3.0	3.0	3.6	3.5
25	2.8	2.8	3.2	2.7	3.0	3.55	3.2	3.0	2.6	3.6	3.6
26	2.8	2.7	3.8	2.7	3.0	3.2	3.2	3.6	2.6	3.6	3.4
27	3.0	3.0	3.2	2.5	2.7	3.0	3.2	3.0	4.2	3.4	3.4
28	2.7	3.2	3.2	2.7	3.3	3.0	3.0	3.0	4.0	3.4	3.4
29	2.7	3.2	3.0	2.7	2.8	2.7	3.0	....	3.8	3.2	3.4
30	2.8	3.0	3.2	3.8	3.0	2.6	3.0	....	3.6	3.6	3.2
31	2.7	3.0	....	3.5	....	3.0	3,2	....	3.6	....	....

NOTE.— Station discontinued May 30, 1919. *a* No record.

LIMESTONE CREEK AT FAYETTEVILLE

Gage No. 194

This station, established August 27, 1905, is located above the State dam at the head of the Erie canal feeder at Fayetteville. A staff gage, secured to the south abutment of the State dam, was used until August 23, 1916, when a standard Type A gage, No. 194, was erected on the west wing of the south abutment of the bridge over the feeder. This gage has a range of 6 feet, between elevations 429.0 and 435.0. The gage bench-mark is a square cut in top of wall at gage and is at elevation 434.664 (B. C. datum).

The gage is read once daily — at noon — to half-tenths.

Daily elevation of water-surface (B. C. datum) of LIMESTONE CREEK ABOVE DAM AT FAYETTEVILLE, for the year ended June 30, 1919. D. R. Burhans, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	431.45	431.10	430.85	431.05	431.50	431.50	431.85	431.60	431.60	431.70	431.76	431.57
2.....	431.50	431.20	430.70	431.20	431.50	431.60	431.80	431.60	431.60	431.75	431.85	431.55
3.....	431.50	431.20	430.55	431.50	431.50	431.40	431.80	431.60	431.80	431.75	431.75	431.50
4.....	431.50	431.15	430.65	431.40	431.70	431.40	431.65	431.60	431.70	432.17	431.72	431.47
5.....	431.40	431.25	430.75	431.35	431.60	431.40	431.60	431.60	431.70	432.30	431.77	431.47
6.....	431.35	431.25	430.90	431.45	431.60	431.45	431.50	431.60	431.75	432.13	431.71	431.45
7.....	431.35	431.20	431.45	431.30	431.40	431.40	431.50	431.55	431.75	432.57	431.65	431.50
8.....	431.30	431.25	431.30	431.20	431.40	431.40	431.60	431.55	431.75	432.16	431.67	431.46
9.....	431.30	431.30	430.70	431.30	431.40	431.40	431.60	431.50	431.80	432.24	431.66	431.45
10.....	431.40	431.40	430.60	431.35	431.40	431.50	431.65	431.50	432.00	432.21	431.92	431.46
11.....	431.50	431.35	430.50	431.35	431.40	431.50	431.60	431.50	431.90	432.25	432.35	431.30
12.....	431.40	431.30	430.50	431.30	431.45	431.60	431.60	431.50	431.70	432.90	432.15	430.95
13.....	431.40	431.30	430.60	429.90	431.40	432.00	431.60	431.55	431.70	432.34	432.14	431.10
14.....	431.35	431.20	430.50	431.20	431.20	432.00	431.65	431.55	431.70	432.20	431.90	431.05
15.....	431.35	431.20	431.55	431.50	431.30	432.10	431.65	431.90	431.65	432.05	431.85	430.95
16.....	431.35	431.10	431.40	431.30	431.30	431.80	431.70	431.85	432.00	432.01	431.80	431.20
17.....	431.35	431.10	431.30	431.05	431.45	431.75	431.60	431.70	432.00	432.50	431.93	431.12
18.....	431.30	430.30	431.40	431.20	431.50	431.70	431.60	431.55	432.00	432.05	431.92	431.06
19.....	431.25	430.50	431 50	431.40	431.60	431.65	431.60	431.55	431.85	431.91	431.81	431.65
20.....	431.00	430.50	431.70	431.40	431.60	431.60	431.60	431.55	431.80	431.86	431.75	431.25
21.....	431.00	430.50	431.50	431.35	431.60	431.60	431.65	431.60	431.75	431.91	431.75	431.15
22.....	431.00	430.50	431.30	431.35	431.70	431.70	431.70	431.55	431.75	431.81	431.74	431.00
23.....	429.90	430.50	431.50	431.30	431.50	431.70	431.85	431.55	431.70	431.78	432.55	431.02
24.....	429.80	430.55	431.40	431.35	431.45	431.90	431.80	431.55	431.70	431.81	432.36	430.97
25.....	429.80	430.80	431.30	431.40	431.45	432.00	431.75	431.60	431.70	431.79	432.20	431.05
26.....	429.80	431.10	431.30	431.50	431.45	431.80	431.75	431.60	431.65	431.77	432.03	431.05
27.....	429.80	430.85	431.30	431.50	431.40	431.70	431.70	431.60	431.65	431.86	431.97	431.05
28.....	430.75	430.80	431.35	431.40	431.35	431.70	431.65	431.55	431.80	431.95	431.86	431.07
29.....	430.70	430.90	431.30	431.45	431.40	431.70	431.70	......	431.80	432.00	431.81	430.95
30.....	430.60	430.80	431.30	431.50	431.40	431.85	431.65	......	431.70	431.80	431.75	430.90
31.....	431.10	430.80	......	431.75	......	432.00	431.60	......	431.70	......	431.67	......

LIMESTONE FEEDER AT FAYETTEVILLE

Gage No. 193

This station, established August 27, 1905, is located at the head of the Limestone feeder at Fayetteville.

The record is of the water-surface below the gates supplying the feeder for Limestone creek. Elevations were obtained by use of a reference point until August 23, 1916, when a standard Type A gage, No. 193, was erected on the east end of the north abutment of the bridge over the feeder at the dam. This gage has a range of 8 feet, between elevations 426.0 and 434.0 (B. C. datum).

The gage is read once daily — at noon — to half-tenths.

Daily elevation of water-surface (B. C. datum) of LIMESTONE FEEDER AT FAYETTEVILLE, for the year ended June 30, 1919. D. R. Burhans, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	429.3	429.2	429.15	429.2	429.0	429.1	......	......	......	......	......	429.25
2	429.3	429.2	429.15	429.3	429.0	429.1	......	......	......	......	......	429.2
3	429.3	429.2	429.15	429.35	429.3	429.0	......	......	......	......	......	429.2
4	429.2	429.2	429.1	429.25	429.25	429.0	......	......	......	......	......	429.15
5	429.2	429.25	429.0	429.15	429.2	429.0	......	......	......	......	427.2	429.1
6	429.2	429.25	429.1	429.2	429.1	429.0	......	......	......	......	427.8	429.1
7	429.2	429.25	429.2	429.25	429.1	428.9	......	......	......	......	428.15	429.15
8	429.2	429.25	429.1	429.3	429.0	428.9	......	......	......	......	428.35	429.1
9	429.25	429.25	428.95	429.3	429.0	428.7	......	......	......	......	428.6	429.1
10	429.25	429.25	429.0	429.35	429.0	428.4	......	......	......	......	428.95	429.0
11	429.3	429.25	429.0	429.3	429.1	427.2	......	......	......	......	429.35	428.95
12	429.3	429.2	429.0	429.3	429.25	......	......	......	......	......	428.7	428.95
13	429.3	429.15	428.95	429.25	429.3	......	......	......	......	......	428.3	429.0
14	429.25	429.1	429.0	429.3	429.2	......	......	......	......	......	428.7	429.0
15	429.25	429.1	429.0	429.35	429.3	......	......	......	......	......	429.15	429.0
16	429.3	429.1	429.1	429.3	429.4	......	......	......	......	......	429.3	429.0
17	429.3	429.1	429.2	429.3	429.3	......	......	......	......	......	429.2	429.0
18	429.25	429.0	429.25	429.3	429.3	......	......	......	......	......	429.3	429.0
19	429.15	428.9	429.2	429.3	429.3	......	......	......	......	......	429.25	428.9
20	429.1	428.8	429.2	429.3	429.25	......	......	......	......	......	429.25	429.9
21	429.0	428.8	429.2	429.3	429.2	......	......	......	......	......	429.3	429.05
22	429.0	428.8	429.1	429.25	429.2	......	......	......	......	......	429.3	429.1
23	429.0	428.75	429.15	429.3	429.2	......	......	......	......	......	429.45	429.05
24	429.0	428.7	429.2	429.3	429.0	......	......	......	......	......	429.4	429.15
25	429.0	428.8	429.2	429.3	429.1	......	......	......	......	......	429.4	429.0
26	429.0	428.9	429.25	429.3	429.2	......	......	......	......	......	429.3	429.0
27	429.0	428.8	429.2	429.3	429.3	......	......	......	......	......	429.3	429.1
28	429.1	429.0	429.15	429.25	429.2	......	......	......	......	......	429.3	429.2
29	429.1	429.1	429.1	429.2	429.2	......	......	......	......	......	429.25	429.3
30	429.2	429.2	429.1	429.2	429.1	......	......	......	......	......	429.15	429.25
31	429.2	429.15	......	429.1	......	......	......	......	......	......	429.2	......

NOTE.— Water below gage, feeder drawn, December 12 to May 4.

BLACK RIVER DRAINAGE BASIN

.BLACK RIVER

DESCRIPTION

Black river rises in the western part of Hamilton county, flows southwestward across Herkimer county into Oneida county, turns near Forestport and runs somewhat west of north through Lewis county to eastern Jefferson county and then flows westward to Black River bay, at the eastern extremity of Lake Ontario. Its total drainage area is 1,930 square miles. The upper part of the basin is very rugged and mountainous, contains a large number of lakes and is in a part of the Adirondack forest.

The mean annual precipitation is about 40 inches, ranging from 55 inches in the extreme headwaters to perhaps 30 inches near Lake Ontario. The winters are generally quite severe and the stream flow is affected by ice for periods of several months.

The regimen of the river is controlled by storage on its upper tributaries (including Beaver river at Beaver River), a series of reservoirs on the headwaters of Moose river and additional reservoirs at Forestport and on the headwaters of the main river.

Water is diverted from Black river through Forestport feeder to supply the Black River canal at Boonville. A portion of this diverted water flows northward from Boonville and enters Black river again at Lyons Falls; the remainder flows southward through the Black River canal and enters the Erie canal at Rome.

BLACK RIVER NEAR BOONVILLE

Location.— At highway bridge about 1 mile above the mouth of Sugar river, about 2 miles northeast of Boonville, Oneida county, and 2 miles, by river, downstream from Hawkinsville.

Drainage area.— 303 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— February 16, 1911, to June 30, 1919.

Gage.— Chain, near center of left span, downstream side of bridge. Staff gage, on right abutment, used for high-water readings; read by W. D. Charbonneau.

Discharge measurements.— Made from a cable about ½ mile above gage at high stages and by wading near the cable at low stages.

Channel and control.— Rough and full of boulders; permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 10.2 feet at 8 A. M., April 13; discharge, 5,810 second-feet. Minimum stage recorded, 2.40 feet at 5 P. M., August 26; discharge, 4 second-feet.

1911–1919: Maximum stage, about 12.5 feet during night of March 28, 1913, determined by leveling from flood-mark; discharge, about 10,000 second-feet. Minimum stage recorded, 2.40 feet at 5 P. M., August 26, 1918; discharge, 4 second-feet.

Ice.— Stage-discharge relation affected by ice.

Regulation and diversion.— The State dam at Forestport, about 8 miles upstream, provides a reservoir with a capacity of about 2,000,000,000 cubic feet. Water is diverted from this reservoir during the navigation season through the Forestport feeder, flowing west to a basin in Boonville. The Black River canal flows north from this basin, entering the Black river at the foot of Lyons falls. A spillway from the basin overflows into Mill creek, a tributary to Black river. Water flowing through these two channels returns to the river below the gaging station, thus passing around it. The Black River canal also flows south from Boonville, passing out of the Black river basin and entering the summit level of the Erie canal (or Barge canal) at Rome.

Occasional discharge measurements have been made at three points, to indicate the distribution of the diverted water. The water entering Boonville through the Forestport feeder has been measured at the highway bridge, about a mile northeast of Boonville. During October, 1915, two water-stage recorders were installed on this canal to obtain a continuous record of the flow. This record is published as a separate station, "Forestport feeder near Boonville." The water flowing north from the basin through the Black River canal has been measured at the highway bridge just below the lock into this canal near the railroad station. The water flowing south from the basin has been measured at a private

farm bridge about a mile southeast of Boonville. During September, 1915, two water-stage recorders were installed on this canal, to obtain a continuous record of the flow, which is published as a separate station, called "Black River canal, flowing south, near Boonville."

Accuracy.— Stage-discharge relation permanent, but affected by ice during a large part of the period, December to March. Rating curve well defined between 35 and 2,800 second-feet and fairly well defined between 2,800 and 4,500 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good, except for periods when the stage-discharge relation was affected by ice, for which they are fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of BLACK RIVER NEAR BOONVILLE, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
Jan. 7	M. H. Carson	5.49	608
June 7	M. H. Carson	3.50	66.8
June 8	M. H. Carson	3.44	61.4

Daily discharge, in second-feet, of BLACK RIVER NEAR BOONVILLE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	194	28	119	305	2,270	512	630	490	855	1,140	735	320
2	250	42	90	335	2,160	535	795	450	795	1,460	920	227
3	216	46	66	352	1,640	605	1,370	430	795	1,210	1,140	184
4	205	49	72	335	1,140	580	1,640	410	680	1,140	1,370	84
5	154	49	90	470	680	535	1,060	410	630	920	1,460	42
6	63	44	70	680	630	535	580	335	490	1,060	1,640	38
7	66	36	174	920	535	630	605	335	490	1,370	1,740	31
8	154	24	227	1,060	558	630	630	320	735	1,740	2,050	33
9	558	28	194	920	580	735	580	335	1,140	1,740	1,740	36
10	855	56	184	855	490	735	605	305	1,140	1,740	1,540	28
11	795	84	227	795	390	735	535	335	1,290	2,160	1,290	33
12	535	70	275	795	512	795	470	410	1,060	3,880	990	41
13	174	56	305	605	605	855	430	450	630	5,520	855	53
14	145	61	410	490	580	855	430	795	490	4,960	735	49
15	535	46	535	238	580	920	450	990	535	4,280	795	49
16	430	44	450	184	558	1,060	450	920	1,210	3,490	680	46
17	262	49	410	145	558	920	470	735	2,160	2,620	680	46
18	205	59	680	119	430	855	470	580	1,940	1,940	795	66
19	154	70	795	164	470	920	430	450	1,460	1,370	1,060	59
20	127	59	990	275	680	855	430	390	1,460	1,140	1,060	46
21	104	46	1,140	735	630	920	512	335	1,140	1,060	680	51
22	111	33	855	795	490	795	535	335	795	920	680	66
23	63	27	795	580	450	1,940	580	352	990	920	535	59
24	66	21	795	535	335	2,620	512	335	1,290	795	490	49
25	49	11	735	630	194	2,270	490	335	1,060	795	558	71
26	30	7	795	855	630	1,940	450	370	920	795	580	97
27	40	10	795	990	990	1,460	535	535	855	795	680	72
28	44	26	735	795	490	1,290	580	680	855	795	605	66
29	49	53	680	680	262	1,060	630	......	680	680	580	63
30	30	70	605	990	290	735	680	......	680	680	580	56
31	36	84	......	1,940	......	580	558	......	735	......	535	......
Mean	216	44.8	476	631	694	981	617	469	967	1,770	961	72

NOTE.— Stage discharge relation not affected by ice.

Monthly discharge of BLACK RIVER NEAR BOONVILLE, for the year ended June 30, 1919

[Drainage area, 303 square miles.]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	855	30	216	0.713	0.82
August	84	7	44.8	0.148	0.17
September	1,140	66	476	1.57	1.75
October	1,940	119	631	2.08	2.40
November	2,270	194	694	2.29	2.56
December	2,620	512	981	3.24	3.74
January	1,640	430	617	2.04	2.35
February	990	305	469	1.55	1.61
March	2,160	490	967	3.19	3.68
April	5,520	680	1,770	5.89	6.52
May	2,050	490	961	3.17	3.66
June	320	28	72	0.238	0.27
The year	5,520	7	658	2.17	29.53

FORESTPORT FEEDER NEAR BOONVILLE

Location.— Slope station at lower end of feeder, above point where it enters the basin at Boonville, Oneida county.

Records available.— Occasional discharge measurements, 1900 and 1905 to 1915; continuous record, October 30, 1915, to June 30, 1919. Data published also in annual reports of New York State Engineer and Surveyor and New York State Conservation Commission.

Gages.— Two Gurley 7-day graph water-stage recorders, with natural scale for gage heights. Gage No. 1 is at downstream end of left abutment of steel highway bridge in village of Hawkinsville. Gage No. 2 is on left bank, just below a farm bridge, about a mile above the basin at Boonville. They are 2.53 miles apart. The float wells are 1½ by 2 feet, inside dimensions, and the bottoms are about 1½ feet below normal elevation of water-surface in canal. These gages and the two in the Black River canal (flowing south) near Boonville are all set at the same datum. Recorders inspected by Charles Nugent.

Discharge measurements.— Made from the steel highway bridge at gage No. 1 in Hawkinsville.

Determination of discharge.— Daily discharge determined by use of Chezy formula. **The coefficient, "*c*," is computed from each** current-meter measurement and is plotted on a curve showing the variation of "*c*" through the season. A smooth curve drawn through the plotted points shows the coefficients for intervening days. The other factors in the Chezy formula are obtained from gage-height records and cross-section of the canal.

Ice.— There is usually no flow in the canal during the winter season. Water was observed in the canal several times during the winters of 1917–1918 and 1918–1919 and occasional current-meter measurements of the discharge were made. See list of measurements.

Diversions.— One spillway takes water from the Forestport feeder just below gage No. 2 and a second spillway takes water from the basin in Boonville. Both discharge into Mill creek,

which enters Black river below the Boonville gaging station. No spillway between gage No. 1 and gage No. 2. Other spillways in the feeder above gage No. 1 discharge into Black river above the gaging station. Therefore, this station indicates the total amount of water diverted past the gaging station on Black river near Boonville, and the sum of this record and the record for the Black river near Boonville indicates the total run-off of the Black river basin above these gaging stations.

Regulation.— Flow in the feeder is regulated at the outlet of Forestport reservoir.

Accuracy.— Records good except for days on which discharge varies widely from the mean, for which they are fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of FORESTPORT FEEDER NEAR BOONVILLE, during the year ended June 30, 1919

Date	Made by	Gage Height		Discharge
		Gage No. 1	Gage No. 2	
1918		*Feet*	*Feet*	*Sec.-ft.*
July 18	J. W. Moulton	3.122	1.776	237
July 18	J. W. Moulton	3.124	1.779	243
Aug. 15	C. C. Covert	3.044	1.724	261
Sept. 7	C. C. Covert	3.526	2.005	254
Sept. 20	O. W. Hartwell	3.627	2.057	291
Oct. 18	E. D. Burchard	2.961	1.704	215
Oct. 18	E. D. Burchard	2.964	1.713	216
Nov. 10	E. D. Burchard	3.242	1.970	258
Nov. 10	E. D. Burchard	3.248	1.967	259
Dec. 14 a	E. D. Burchard	b	b	66.7
1919				
Jan. 7 a	M. H. Carson	....	....	53
Feb. 18 a	E. D. Burchard	....	....	53.2
Mar. 9 a	E. D. Burchard	....	....	57.8
June 6	M. H. Carson	2.919	1.58	246
June 8	M. H. Carson	3.020	1.648	257
June 13	M. H. Carson	2.696	1.587	204
June 27	J. W. Moulton	3.226	1.916	268

a Measurements made through complete ice cover. b Gage above water.

Daily discharge, in second-feet, of FORESTPORT FEEDER NEAR BOONVILLE, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	246	238	215	199	205	......	......	......	......	......	......	......
2	292	221	240	217	197	......	......	......	......	......	......	......
3	307	216	229	203	218	......	......	......	......	......	......	......
4	255	207	221	194	216	......	......	......	......	......	......	......
5	254	212	228	192	219	......	......	......	......	......	......	......
6	245	221	239	199	215	......	......	......	......	......	......	......
7	240	222	251	196	211	......	......	......	......	......	......	264
8	238	224	237	203	209	......	......	......	......	......	......	248
9	252	225	200	208	218	......	......	......	......	......	......	227
10	265	233	193	257	255	......	......	......	......	......	......	216
11	264	220	206	275	257	......	......	......	......	......	......	213
12	240	219	242	254	257	......	......	......	......	......	......	216
13	226	220	214	221	257	......	......	......	......	......	......	205
14	249	213	209	194	252	......	......	......	......	......	......	204
15	257	203	238	194	250	......	......	......	......	......	......	205
16	243	197	247	205	248	......	......	......	......	......	......	206
17	236	195	243	217	244	......	......	......	......	......	......	233
18	238	179	240	222	268	......	......	......	......	......	......	240
19	234	220	219	237	256	......	......	......	......	......	......	235
20	224	217	260	223	232	......	......	......	......	......	......	231
21	215	227	252	235	227	......	......	......	......	......	......	230
22	230	227	246	224	222	......	......	......	......	......	......	228
23	239	229	243	217	215	......	......	......	......	......	......	241
24	226	230	214	215	207	......	......	......	......	......	......	229
25	217	222	206	213	194	......	......	......	......	......	......	236
26	206	218	206	243	180	......	......	......	......	......	......	263
27	223	215	251	245	160	......	......	......	......	......	......	281
28	198	209	240	224	140	......	......	......	......	......	......	275
29	205	221	213	218	100	......	......	......	......	......	......	267
30	208	231	196	228	50	......	......	......	......	......	......	261
31	235	238	......	264	...	......	......	......	......	......	......	......
Mean	239	218	228	236	213	......	......	......	......	......	......	263

NOTE.— Discharge estimated, November 26 to 30, by comparing gage-height records of gage No. 1 and No. 2 and making estimate of probable slope between the gages.

Monthly discharge of FORESTPORT FEEDER NEAR BOONVILLE, for the year ended June 30, 1919

Month	Discharge in Second-feet		
	Maximum	Minimum	Mean
July	307	198	239
August	238	179	218
September	260	193	228
October	275	192	236
November	268	....	213
December	....	....	....
January	....	....	....
February	....	....	....
March	....	....	....
April	....	....	....
May	....	....	....
June	281	204	236

NOTE.— Canal closed November 25, 1918.

BLACK RIVER CANAL, FLOWING SOUTH, NEAR BOONVILLE

Location.— Slope station in summit level of Black River canal near Boonville, Oneida county.

Records available.— Occasional discharge measurements, 1900 and 1905 to 1915. Continuous record, September 16, 1915, to June 30, 1919.

Gages.— Seven-day graph water-stage recorders with natural scale for gage heights. They are 1.81 miles apart. These gages and the two gages in the Forestport feeder near Boonville are all set at the same datum.

Gage No. 1 is located on the right bank (opposite tow-path) about 50 feet downstream from the collector's office in Boonville.

Gage No. 2 is located on the right bank (opposite tow-path) about 300 yards above lock 70 and 50 yards above the spillway from the canal into Lansingkill. Recorders inspected by Charles Nugent.

Discharge measurements.— Made from the steel and concrete highway bridge in the village of Boonville, a short distance below gage No. 1.

Determination of discharge.— Daily discharge determined by use of Chezy formula. The coefficient, "*c*," is computed from each current-meter measurement and plotted on a curve showing the variation of "*c*" through the season. A smooth curve drawn through the plotted points shows the coefficients for intervening days. The other factors in the Chezy formula are obtained from gage-height records and cross-section of canal.

Ice.—There is no flow in the canal during the frozen season.

Diversions.— There are no diversions between gage No. 1 and gage No. 2. This station indicates the amount of water diverted from the Black river into the Mohawk river drainage for canal purposes.

Regulation.— Flow in the canal is regulated by the operation of the spillway and sluice-gates at lock 70 and also by discharge of Forestport feeder into the basin at Boonville.

Accuracy.— Records good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of BLACK RIVER CANAL, FLOWING SOUTH, NEAR BOONVILLE, during the year ended June 30, 1919

Date	Made by	Gage Height: Gage No. 1	Gage Height: Gage No. 2	Discharge
1918		*Feet*	*Feet*	*Sec.-ft.*
July 18	J. W. Moulton	1.462	1.262	156
July 18	J. W. Moulton	1.456	1.255	158
Aug. 16	C. C. Covert	1.486	1.196	164
Sept. 20	O. W. Hartwell	1.62	1.29	168
Oct. 16	E. D. Burchard	1.286	1.059	137
Oct. 16	E. D. Burchard	1.286	1.062	136
Nov. 10	E. D. Burchard	1.632	1.404	174
Nov. 10	E. D. Burchard	1.634	1.403	178
1919				
June 7	M. H. Carson	1.399	1.144	197
June 13	M. H. Carson	1.354	1.201	143
June 26	J. W. Moulton	1.634	1.308	228

Daily discharge, in second-feet, of BLACK RIVER CANAL, FLOWING SOUTH, NEAR BOONVILLE, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	165	159	167	138	149	......	......	......	......	......	......	......
2	177	163	173	151	151	......	......	......	......	......	......	......
3	181	153	167	132	162	......	......	......	......	......	......	......
4	154	166	159	136	158	......	......	......	......	......	......	......
5	155	165	173	133	156	......	......	......	......	......	......	......
6	140	150	155	138	155	......	......	......	......	......	......	......
7	157	153	160	123	153	......	......	......	......	......	......	167
8	153	160	161	133	151	......	......	......	......	......	......	172
9	157	169	166	127	157	......	......	......	......	......	......	183
10	160	168	156	144	175	......	......	......	......	......	......	174
11	168	162	153	152	149	......	......	......	......	......	......	152
12	140	158	183	150	166	......	......	......	......	......	......	161
13	138	164	166	137	160	......	......	......	......	......	......	144
14	153	157	158	131	152	......	......	......	......	......	......	154
15	156	157	153	133	153	......	......	......	......	......	......	157
16	150	155	144	142	155	......	......	......	......	......	......	157
17	149	158	160	66	162	......	......	......	......	......	......	183
18	145	143	173	62	168	......	......	......	......	......	......	188
19	143	162	158	151	165	......	......	......	......	......	......	185
20	136	162	166	159	151	......	......	......	......	......	......	177
21	133	162	159	155	148	......	......	......	......	......	......	163
22	151	162	154	145	137	......	......	......	......	......	......	164
23	167	169	144	134	146	......	......	......	......	......	......	181
24	162	166	136	144	159	......	......	......	......	......	......	161
25	162	169	142	146	105	......	......	......	......	......	......	201
26	151	161	132	146	75	......	......	......	......	......	......	227
27	165	157	160	135	0	......	......	......	......	......	......	226
28	158	160	165	156	0	......	......	......	......	......	......	218
29	156	164	143	146	0	......	......	......	......	......	......	205
30	149	165	139	147	0	......	......	......	......	......	......	203
31	152	172	......	152	......	......	......	......	......	......	......	......
Mean	154	161	158	137	131	......	......	......	......	......	......	179

NOTE.— Discharge estimated, November 26 to 30.

Monthly discharge of BLACK RIVER CANAL, FLOWING SOUTH, NEAR BOONVILLE, for the year ended June 30, 1919

Month	Discharge in Second-feet		
	Maximum	Minimum	Mean
July	181	133	154
August	172	143	161
September	183	132	168
October	159	62	187
November	175	0	131
December	....	....	....
January	....	....	....
February	....	....	....
March	....	....	....
April	....	....	....
May	....	....	....
June	227	144	179

NOTE.— Canal dry, December to May, inclusive

BLACK RIVER NEAR FELTS MILLS

This station, originally established by the United States Geological Survey, August 29, 1902, is now maintained by this Department. During the summer of 1910 the timber dam formerly used was replaced by a masonry dam located a few rods downstream. The wood-pulp mill has been in operation since 1907.

Location.— Near the village of Felts Mills at the dam of the LeFebvre Paper Company, formerly owned by the Black River Traction Company. The dam is 9 miles upstream from Watertown and 7 miles upstream from the old Huntingtonville gaging station, formerly maintained on this stream.

Drainage area.— 1,851 square miles.

Records available.— August 29, 1902, to March 31, 1919.

Gages.— The gage above the dam, located on the left bank of the stream about 100 feet upstream from the wheel racks and about the same distance above the crest of the dam, is a vertical enameled steel staff attached securely to the concrete wall, and steps provide access to the gage for reading. Lower gage is an enameled steel staff gage attached to a pile at the tail-race exit.

Discharge measurements.— Discharge over the spillway is calculated by means of the weir formula, using coefficients derived from experiments of the United States Geological Survey for a dam of similar cross-section. Discharge through the wheels is based on ratings furnished by the Paper Company.

Control.— Dam crest and power-wheels. The main crest of the dam is 300.45 feet long and 3.75 feet in width with a slope on the downstream face of about 1 on 1. There are two wings, one about 47 feet long and about 2.7 feet higher than the main crest, the other about 140 feet long and about 3 feet higher than the main crest. Flash-boards are used on the main crest. The mill contains four 72-in. and one 45-in. Smith turbines. A record is kept of the hours run, gate opening and head on each wheel.

Extremes of discharge.— Current year: Maximum stage recorded, March 20 and 21, 9,900 second-feet. Minimum stage recorded, July 28, 908 second-feet.

1902–1919: Maximum stage recorded, March 28, 1913, at 5 P. M., estimated as 32,500 second-feet. Minimum stage recorded, August 6, 1907, 10 second-feet, due to artificial interruption of flow to fill pond at Herring.

Daily discharge, in second-feet, of BLACK RIVER NEAR FELTS MILLS, for the yea ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	1,940	1,540	*680	2,640	6,580	3,500	3,620	1,980	2,440
2	1,810	1,380	1,030	2,410	7,100	3,290	5,620	2,270	3,420
3	3,870	1,290	1,520	2,300	7,100	3,400	5,310	2,160	4,770
4	3,110	1,190	1,270	2,410	6,920	3,730	4,480	2,220	5,040
5	2,820	1,060	1,270	2,640	5,910	3,400	4,470	2,210	5,350
6	2,120	1,110	1,190	3,710	5,260	2,830	4,060	2,210	4,760
7	1,680	1,300	1,[illegible]90	5,110	4,510	2,580	3,470	2,050	4,750
8	1,690	1,200	1,190	5,780	4,100	2,740	3,930	2,[illegible]00	4,770
9	1,860	1,300	1,190	5,110	4,110	3,210	3,570	1,970	4,900
10	2,180	1,250	1,030	4,460	3,840	3,710	3,220	1,830	5,640
11	1,980	1,290	1,430	3,570	3,350	3,280	3,010	1,620	5,960
12	2,160	1,300	1,270	1,890	3,350	3,100	2,740	1,900	6,110
13	2,650	1,140	1,270	2,520	3,220	3,090	1,990	1,910	6,270
14	2,830	1,240	1,110	2,410	3,000	3,830	2,770	2,220	6,100
15	3,110	1,240	1,270	3,160	3,000	6,980	2,790	2,920	5,650
16	2,940	1,240	1,430	2,900	3,000	7,240	2,710	2,740	5,350
17	3,200	1,100	1,430	2,640	3,000	7,600	2,640	2,760	5,360
18	3,030	1,050	3,160	2,410	4,370	6,910	2,490	3,210	8,360
19	2,770	1,020	3,860	2,410	6,780	5,320	2,760	2,920	9,500
20	2,690	925	4,460	2,410	6,580	4,610	2,600	2,670	8,900
21	2,170	979	5,270	2,520	6,270	4,090	2,680	2 280	9,900
22	1,780	1,100	4,940	4,010	5,790	3,740	2,200	2,280	9,500
23	1,680	1,100	4,310	4,010	5,190	5,480	2,580	2,280	9,100
24	1,680	1,100	4,010	3,570	4,350	6,320	3,720	2,280	8,730
25	1,500		4,010	1,700	3,510	4,460	4,610	2,610	8,350
26	1,290		3,710	3,290	3,610	7,340	5,040	2,530	7,800
27	1,160		3,430	4,460	3,210	7,240	5,190	2,440	7,270
28	908	*7,850	3,710	4,690	3,110	6,450	4,750	2,290	7,270
29	1,400		3,290	4,490	3,020	5,330	4,350	......	7,270
30	1,600		2,770	4,640	3,950	3,840	3,740	......	7,630
31	1,240		......	5,560	......	3,520	3,210	..	7,630
Mean	2,156	1,171	2,390	3,414	4,57[illegible]	4,[illegible]86	3,55[illegible]	2,3[illegible]0	6,608

* Dam emptied for repairs from August 25 to September 1, inclusive; discharge estimated from records of U. S. G. S. station at Black River.

Monthly discharge of BLACK RIVER NEAR FELTS MILLS, for the year ended June 30, 1919

[Drainage area, 1,851 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	3,870	908	2,156	1.16	1.34
August	....	....	1,171	0.633	0.73
September	....	....	2,390	1.29	1.44
October	5,780	1,700	3,414	1.84	2.13
November	7,100	3,000	4,570	2.47	2.76
December	7,600	2,580	4,586	2.48	2.86
January	5,620	1,990	3,559	1.92	2.21
February	3,210	1,620	2,320	1.25	1.30
March	9,900	2,440	6,608	3.57	4.12

BLACK RIVER AT BLACK RIVER

Location.— About ¼ mile below the concrete arch highway bridge and the power-plant of the Northern New York Utilities Company and about ¾ mile below the village of Black River, Jefferson county.

Drainage area.— 1,870 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— March 2, 1917, to June 30, 1919.

Gage.— Vertical staff, in two sections, spiked to large cedar tree on the left bank about ¼ mile below the highway bridge; read by Erwin W. Hart.

Discharge measurements.— Made from a cable about 100 yards above the gage.

Channel and control.— Solid rock.

Extremes of discharge.— Current year: Maximum stage, 12.7 feet at 8:30 A. M. and 6:20 P. M., April 14; discharge, 17,300 second-feet. Minimum stage, 2.8 feet at 7:45 P. M., September 1; discharge, 400 second-feet.

1917–1919: Maximum stage recorded, 13.4 feet from 6 P. M., April 4, to 7 A. M., April 5, 1917; discharge, 19,300 second-feet. Minimum stage recorded, 1.05 feet at 2:45 P. M., July 29, 1917; discharge, about 16 second-feet.

Ice.— Stage-discharge relation usually affected by ice.

Diversions.— Water is diverted from Black river into Forestport feeder at Forestport. A portion of this water returns to the river through various spillways and through the Black River canal (flowing north). The remainder passes out of the drainage basin through the Black River canal (flowing south). The record at the station on the Black River canal (flowing south) at Boonville indicates the amount of this diversion. See also "Regulation and diversion" in description of station on Black river near Boonville.

Regulation.— Seasonal distribution of flow is regulated by Beaver river flow, Fulton Chain lakes, Forestport reservoir and other storage reservoirs in the upper portion of the drainage basin. Some diurnal fluctuation at low stages, due to mills and power-plants above the station.

Accuracy.— Stage-discharge relation fairly permanent. Rating curve well defined between 500 and 18,000 second-feet. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results good except for days of low discharge, when they may be poor.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of Black River at Black River, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
June 6	M. H. Carson	3.98	1,370
June 9	M. H. Carson	3.90	1,360

Daily discharge, in second-feet, of BLACK RIVER AT BLACK RIVER, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	1,470	1,100	680	2,990	7,610	3,250	5,510	2,730	1,960	8,770	5,190	3,830
2	1,680	1,100	745	2,860	6,880	2,600	6,180	1,900	2,120	8,180	5,520	3,410
3	3,390	1,100	620	2,120	7,610	2,860	6,880	1,470	2,860	7,990	5,520	2,740
4	3,250	1,100	950	2,240	6,880	3,390	4,870	1,470	2,860	7,240	6,390	2,620
5	2,120	1,020	1,270	2,480	6,350	2,860	3,950	1,570	3,120	7,990	6,030	2,030
6	1,900	950	950	2,730	5,190	2,600	3,670	1,680	3,120	7,990	6,570	1,400
7	2,120	1,100	810	4,870	4,710	2,240	4,100	1,470	3,670	9,370	6,390	1,700
8	1,680	845	712	5,840	3,950	2,360	3,670	1,270	3,810	9,570	6,030	1,600
9	2,240	1,100	1,020	5,350	3,670	2,860	3,950	680	3,390	9,780	5,520	1,400
10	3,390	950	1,100	4,550	3,120	3,250	4,100	590	4,550	10,200	4,720	1,700
11	2,120	1,900	950	3,810	3,390	3,120	2,730	590	6,180	11,100	4,270	1,040
12	1,680	1,370	1,100	3,120	3,530	2,730	1,790	950	6,520	12,600	4,120	960
13	1,900	950	1,100	2,600	3,670	2,600	1,790	1,470	5,670	14,600	5,860	1,130
14	2,360	1,100	1,790	2,360	4,250	3,670	1,900	1,790	5,840	17,300	5,350	960
15	3,120	950	810	2,360	4,400	4,100	2,240	1,900	5,190	16,800	4,870	879
16	3,670	880	650	2,240	4,100	4,250	2,120	2,360	4,400	16,200	4,570	1,220
17	2,990	1,180	560	2,600	3,810	3,950	2,240	2,600	4,550	12,400	4,120	1,310
18	2,480	1,570	1,470	2,120	4,870	3,670	2,360	2,600	5,030	10,600	4,870	1,220
19	2,600	1,370	3,120	2,240	6,180	3,250	2,120	2,360	10,400	10,200	6,210	1,310
20	2,480	950	3,390	2,010	7,240	2,990	2,010	2,240	10,200	9,120	7,120	1,040
21	1,900	1,470	4,250	3,670	6,880	2,860	2,240	1,680	10,400	7,900	6,570	960
22	1,790	1,100	4,710	4,550	6,520	2,360	1,900	1,470	10,400	7,900	6,750	960
23	1,680	1,370	4,400	4,100	4,550	3,390	2,120	1,900	9,780	7,500	7,310	1,130
24	1,370	1,680	4,870	3,530	3,250	4,550	3,120	2,240	9,990	7,500	6,390	840
25	1,370	1,270	3,670	2,990	3,250	5,670	4,550	2,010	8,770	7,310	5,350	1,040
26	1,470	1,180	2,730	3,390	3,390	8,570	4,870	2,120	8,370	6,030	5,190	1,220
27	1,270	880	2,480	4,870	3,390	7,990	5,350	1,680	7,990	6,030	4,870	1,310
28	810	1,100	3,120	5,510	3,670	7,060	4,550	1,470	8,370	5,350	4,570	2,030
29	1,100	1,100	3,530	5,350	3,250	5,840	3,950	......	8,570	5,350	3,830	1,600
30	1,270	1,370	3,390	6,180	3,670	6,180	3,120	......	8,180	4,870	3,410	1,810
31	1,020	950	......	7,060	......	5,030	2,860	......	8,770	......	3,830	......
Mean	2,050	1,160	2,030	3,640	4,770	3,940	3,450	1,720	6,270	9,460	5,400	1,550

Monthly discharge of BLACK RIVER AT BLACK RIVER, for the year ended June 30, 1919

[Drainage area, 1,870 square miles]

Month	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	3,670	810	2,050	1.10	1.27
August	1,900	845	1,160	0.620	0.71
September	4,870	560	2,030	1.09	1.22
October	7,060	2,010	3,640	1.94	2.24
November	7,610	3,120	4,770	2.55	2.94
December	8,570	2,240	3,940	2.11	2.43
January	6,880	1,790	3,450	1.84	2.12
February	2,730	590	1,720	0.920	0.96
March	10,400	1,900	6,270	3.35	3.86
April	17,300	4,870	9,460	5.06	5.64
May	7,310	3,410	5,400	2.89	3.33
June	3,830	840	1,550	0.829	0.92
The year	17,300	560	3,787	2.03	27.54

MOOSE RIVER

DESCRIPTION

Moose river is tributary to Black river at Lyons Falls, joining Black river just above the head of the fall of about 50 feet. The drainage of Moose river lies chiefly in Hamilton and Herkimer counties and comprises a wild, rugged and little inhabited region, largely forest-covered, but containing also large tracts of cut and burned-over lands and numerous and extensive swamps and lakes. The stream above the gaging station near McKeever comprises three main branches. The south branch is chiefly broad and sluggish. The area tributary to this branch contains extensive swamps and marshes and but few lakes, the most important lakes being the Limekill and Little Moose lakes. The middle branch is substantially a continuous chain of lakes, known as the Fulton Chain, extending from Old Forge a distance of about 15 miles upstream through eight different lakes. The outflow from Fulton Chain is artificially controlled by a State dam at Old Forge. The first to fourth lakes, inclusive, are at elevation 1,706 feet above tide. There is also a dam at the outlet of the sixth lake. Sixth, Seventh and Eighth lakes are at elevations 1,785 to 1,788 feet above tide. The north branch of the stream is made up of a large number of scattered lakes, the most important one being Big Moose lake. The lower course of the north branch is sluggish and tortuous. The drainage basin above McKeever is nearly all shown on the Big Moose, Raquette lakes, Old Forge and West Canada lakes sheets of the United States Geological Survey topographic maps.

MOOSE RIVER AT MOOSE RIVER

Location.— In the village of Moose River, Lewis county, about 3 miles downstream from McKeever, 5 miles below the mouth of South branch of Moose river and nearly 20 miles above the junction of Black and Moose rivers at Lyons Falls.

Drainage area.— 370 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— June 5, 1900, to June 30, 1919.

Gage.— Staff in two sections, on the left bank a short distance above the cable; read by H. W. Hoch. The gage datum was lowered 0.17 foot on February 28, 1903, and again 5.00 feet on January 1, 1913.

Discharge measurements.— Made from a cable a short distance below the gage.

Channel and control.— Cobblestones and boulders; fairly permanent. Current smooth; depth comparatively uniform. Ice and logs occasionally jam above the station on a small island.

Extremes of discharge.— Current year: Maximum stage recorded, 14.5 feet, at 8 A. M., April 12; discharge, 10,400 second-feet. Minimum stage recorded, 5.25 feet, at 8 A. M., June 27; discharge, 93 second-feet.

1900–1919: Maximum stage recorded, 16.3 feet, during the afternoon of March 27, 1913, determined by leveling from flood-marks; discharge, about 16,500 second-feet. Minimum stage recorded, 4.94 feet, July 21, 23, 25, 26, and 27, 1913; discharge, about 42 second-feet.

Ice.— Stage-discharge relation affected by ice.

Regulation.— A timber dam at McKeever, 3 miles upstream, is used for power and for the regulation of flow during log-driving. Seasonal distribution of flow affected by operation of the State dam at Old Forge. This regulation is indicated by records from station, "Middle Branch of Moose River at Old Forge."

Accuracy.— Stage-discharge relation practically permanent; usually affected by ice for a large part of the period from December to March. Rating curve fairly well defined between 100 and 5,500 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results fairly good except for periods when the discharge is low or the stage-discharge relation is affected by ice, for which they are fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of MOOSE RIVER AT MOOSE RIVER, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Oct. 17	E. D. Burchard	7.35	850
1919			
Jan. 8 *a*	E. D. Burchard	7.15	698
Feb. 19 *a*	E. D. Burchard	6.59	472

a Some backwater due to ice.

Daily discharge, in second-feet, of MOOSE RIVER AT MOOSE RIVER, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	369	202	540	715	2,660	580	760	500	1,020	1,590	1,260	670
2	1,320	216	500	625	1,910	760	965	460	1,140	1,380	1,260	500
3	810	280	422	625	1,590	670	965	500	965	1,320	1,670	441
4	715	230	189	760	1,450	670	1,020	422	1,080	1,320	1,320	164
5	625	176	352	860	1,320	670	715	422	910	1,380	1,450	422
6	404	151	259	1,380	1,200	580	600	404	910	910	1,590	590
7	386	151	230	2,460	860	625	650	386	965	2,090	1,450	202
8	386	151	422	1,750	965	540	700	422	1,020	2,460	1,320	259
9	422	126	422	1,670	965	580	650	422	1,080	2,860	1,200	259
10	441	189	259	1,140	860	625	650	422	1,200	3,060	1,020	230
11	715	230	176	1,020	715	670	650	422	1,590	3,060	1,020	230
12	760	176	336	1,020	760	625	600	441	1,260	9,250	1,140	189
13	810	202	386	910	760	580	600	422	1,080	3,620	1,020	176
14	860	164	460	1,080	760	540	600	500	965	2,960	910	138
15	810	151	441	1,080	670	1,060	550	580	715	2,660	860	202
16	670	259	352	910	670	1,910	500	625	810	2,360	760	259
17	580	336	860	860	404	1,320	480	580	715	2,270	910	352
18	670	320	1,260	810	580	1,140	460	550	1,450	2,270	2,090	352
19	625	202	1,260	715	910	1,020	440	500	2,460	1,910	2,090	304
20	540	151	1,140	760	1,320	860	440	480	2,180	1,450	1,380	259
21	386	164	1,200	1,080	1,080	670	440	420	2,270	1,450	1,260	259
22	336	189	1,380	1,200	965	580	422	400	2,460	1,670	1,080	230
23	289	289	1,140	1,020	860	1,750	422	420	2,000	1,450	1,260	230
24	274	274	1,140	965	625	2,660	1,020	420	2,090	1,320	1,200	189
25	259	230	1,080	860	715	1,670	1,380	420	2,180	1,590	1,080	320
26	230	259	1,020	965	670	1,260	1,450	440	1,750	1,380	1,200	176
27	216	259	1,080	1,140	580	1,260	965	500	2,360	860	1,080	320
28	244	259	1,200	1,140	580	1,020	760	670	2,960	1,140	760	540
29	230	230	1,140	1,020	670	760	760	......	3,060	1,260	715	422
30	244	259	910	1,320	860	860	580	......	2,090	1,260	760	189
31	274	230	......	2,460	......	810	500	......	1,830	......	860	......
Mean	513	215	719	1,110	964	947	700	470	1,570	2,120	1,190	299

NOTE.— Stage-discharge relation affected by ice, January 6 to 21 and February 18 to 26. Daily discharge for these periods is approximate.

Monthly discharge of Moose River at Moose River, for the year ended June 30, 1919

[Drainage area, 370 square miles]

Month	Discharge in Second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	1,320	216	513	1.39	1.60
August	336	126	215	0.581	0.67
September	1,380	176	719	1.94	2.16
October	2,460	625	1,110	3.00	3.46
November	2,660	404	964	2.61	2.91
December	2,660	540	947	2.56	2.95
January	1,450	422	700	1.89	2.18
February	670	400	470	1.27	1.82
March	3,060	715	1,570	4.24	4.89
April	9,250	860	2,120	5.73	6.39
May	2,090	715	1,190	3.22	3.71
June	670	138	299	0.808	0.90
The year	9,250	126	901	2.44	33.14

MIDDLE BRANCH OF MOOSE RIVER AT OLD FORGE

Location.— About 300 feet below the highway bridge and 400 feet below the State dam at Old Forge, Herkimer county.

Drainage area.— 51.5 square miles. (Measured on U. S. Geological Survey topographical maps.)

Records available.— November 9, 1911, to June 30, 1919.

Gage.— Vertical staff on left bank, 300 feet below highway bridge. Gage read by Jacob Edick.

Discharge measurements.— Made from highway bridge or by wading near gage.

Channel and control.— Bed near gage composed of stone and gravel. Control is rock ledge about 200 feet below gage, practically permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 4.1 feet, at 8 A. M., April 13; discharge, 557 second-feet. Minimum stage recorded, 1.00 foot several times in August; discharge, 27 second-feet. Minimum stage occurs when the gates of the dam are closed, discharge being due to leakage and discharge through the fish hatchery.

1911–1919: Maximum stage recorded, 6.3 feet, March 28, 1913 (stage-discharge relation affected by backwater from Moose river); discharge computed from records at dam, 760 second-feet. Minimum stage recorded, 1.00 foot several times in August, 1918; discharge, 27 second-feet.

Ice.— Stage-discharge relation not affected by ice.

Regulation.— Flow controlled by dam.

Accuracy.— Stage-discharge relation practically permanent between dates of shift; not affected by ice. Rating curve well defined from 20 to 400 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying to rating table mean daily gage height, weighted on days of changing gates from records of gate opening at dam. Records good except those computed from gate openings at the dam, which are fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurement of MIDDLE BRANCH OF MOOSE RIVER AT OLD FORGE, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 16........	J. W. Moulton....................................	2.76	212

Daily discharge, in second-feet, of MIDDLE BRANCH OF MOOSE RIVER AT OLD FORGE, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	34	34	104	98	214	116	80	56	70	290	189	31
2......	25	34	104	98	232	116	80	58	75	280	189	29
3......	31	28	104	116	232	116	80	60	75	270	189	29
4......	32	27	104	165	232	116	80	60	75	260	189	29
5......	33	27	104	181	232	116	80	60	75	260	189	29
6......	34	27	104	214	232	116	80	60	80	250	189	43
7......	40	28	104	214	223	116	80	60	86	232	181	40
8......	42	28	98	241	214	116	80	60	86	220	143	40
9......	36	29	98	270	214	116	80	60	92	220	65	40
10......	36	31	98	280	181	116	80	60	110	220	65	40
11......	43	33	98	260	150	116	60	60	123	220	65	39
12......	74	32	98	260	150	110	40	60	130	220	49	37
13......	200	31	98	260	150	98	43	60	130	220	46	36
14......	223	31	98	250	150	75	45	61	123	220	45	34
15......	298	32	110	241	150	75	45	63	116	220	40	39
16......	324	30	98	241	116	75	43	65	104	220	40	39
17......	272	29	98	241	98	75	43	65	104	220	44	39
18......	200	29	104	241	104	75	43	65	123	200	49	45
19......	36	27	104	232	104	75	43	65	130	200	55	48
20......	42	75	104	232	116	75	43	65	136	200	58	48
21......	44	173	104	223	123	75	45	65	150	200	54	48
22......	58	173	104	214	123	75	45	65	165	200	53	45
23......	63	173	104	206	123	75	45	65	165	200	50	40
24......	63	173	104	206	116	75	48	65	158	197	48	33
25......	58	165	98	214	116	80	53	65	158	197	53	32
26......	58	165	98	214	116	86	53	65	150	197	48	33
27......	58	165	104	214	116	86	54	65	150	197	50	35
28......	58	116	98	214	116	86	56	65	150	197	50	39
29......	58	98	98	214	116	86	56	......	173	197	50	39
30......	58	98	98	214	116	86	56	......	181	189	48	39
31......	86	98	......	214	......	80	56	......	260	......	42	......
Mean...	87.6	72.2	101	216	156	93.5	58.6	62.2	126	220	84.7	37.9

NOTE.— Discharge, July 1 to 12, determined from special rating curves based on discharge measurements, because of logs on the control. Discharge, September 21 to 23 and April 8 to 23, estimated because of logs on the control.

Monthly discharge of MIDDLE BRANCH OF MOOSE RIVER AT OLD FORGE, for the year ended June 30, 1919

[Drainage area, 51.5 square miles]

Month	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	324	25	87.6	1.70	1.96
August	173	27	72.2	1.40	1.61
September	110	98	101	1.96	2.19
October	280	98	216	4.20	4.84
November	232	98	156	3.03	3.38
December	116	75	93.5	1.82	2.10
January	80	40	58.6	1.14	1.31
February	65	56	62.2	1.21	1.26
March	260	70	126	2.45	2.82
April	290	189	220	4.27	4.76
May	189	40	84.7	1.64	1.89
June	48	29	37.9	0.736	0.82
The year	324	25	110	2.14	28.94

BEAVER RIVER

East pond, at elevation about 1,956 feet, situated in the lake region of northern Hamilton county, may be said to be the headwaters of Beaver river. This pond is connected by a series of lakes, brooks and swamps with Beaver river flow, which is drained by Beaver river proper, all flowing in a general westerly direction. Razorback pond in Herkimer county is probably the highest body of water draining into Beaver river, being at elevation about 2,200.

From East pond to the junction of Beaver and Black rivers, about eight miles above Carthage, there is a total fall of about 1,200 feet in a distance of about 60 miles.

The principal tributary, Twitchell creek, having its source in Twitchell lake, near Big Moose lake, flows in a general northwesterly direction, emptying into Beaver river flow about 3½ miles above the State dam.

BEAVER RIVER AT STATE DAM, NEAR BEAVER RIVER

Location.— At the concrete storage dam, at the outlet of Beaver river flow, about 7½ miles west of Beaver River P. O., Herkimer county, and 7 miles above Beaver lake at Number Four.

Drainage area.— 176 miles square. (Measured on U. S. Geological Survey topographical maps.)

Records available.— May 11, 1908, to June 30, 1919.

Gages.— Elevation of water-surface in the reservoir is determined by a staff gage in two sections, on the west corner of the gate-house; read by James Dunbar, gate-tender. The mean elevation of the crest of the spillway is at gage height 16.96 feet.

Prior to September 28, 1913, elevation of water-surface was determined by measuring the distance from the water-surface to a reference point set at the elevation of the crest of the spillway.

Widths of sluice-gate openings determined by measuring on the gate stems the distance they have been raised.

Discharge measurements.— Current-meter measurements made from a temporary foot-bridge at the mouth of the outlet tunnel, below the gates. Discharge over the spillway has not been measured.

Determination of discharge.— Records include the discharge through one or more of four 4-foot circular sluice-gates, when opened, the discharge over the spillway and the discharge through the logway at the west end of the spillway.

The sluice-gates have been rated by current-meter measurements made at different lake elevations, but no measurements have been made of the discharge over the spillway or through the logway. Theoretic coefficients based on the Cornell Experiments* have been used to compute ratings for the spillway and logway.

Regulation.— At ordinary stages the discharge of Beaver river is completely regulated by the operation of the sluice-gates.

Extremes of stage.— Current year: Maximum elevation of water-surface recorded in reservoir, 18.9 feet at 7:15 A. M., April 12. Minimum stage recorded, 9.6 feet at 4:30 P. M., September 14, and 2 P. M., September 15.

1908–1919: Maximum elevation of water-service in reservoir, 19.46 feet on March 29, 1913. Minimum stage, 2.9 feet on September 29 and October 1, 1913.

Extremes of discharge.— Current year: Maximum daily discharge, 2,700 second-feet on April 12. Minimum discharge, about 4 second-feet March 22, when all gates were closed.

*United States Geological Survey Water Supply paper 200.

1908–1919: Maximum discharge, 3,296 second-feet on May 2, 1911. Minimum discharge, zero during periods when gates were closed and there was no flow over spillway.

Accuracy.— Stage-discharge relation permanent; probably not affected by ice. Rating curves for sluice gates well defined. Lake gage read to half-tenths once daily. The accuracy of computations depends to a large extent on the care with which the gates were set to the recorded openings. Records fair.

Coöperation.— Gaging station maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Daily gage height, in feet, of BEAVER RIVER AT STATE DAM, NEAR BEAVER RIVER, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	17.35	16.5	11.5	12.0	17.4	17.25	17.3	16.35	13.5	17.8	17.7	17.5
2	17.4	16.4	11.35	12.0	17.8	17.25	17.35	16.25	13.5	17.8	17.7	17.5
3	17.5	16.2	11.1	12.15	17.8	17.25	17.4	16.15	13.5	17.8	17.7	17.45
4	17.45	16.0	11.0	12.3	17.7	17.2	17.35	16.1	13.5	17.85	17.8	17.4
5	17.4	15.8	10.85	12.4	17.6	17.2	17.35	16.0	13.55	17.85	17.9	17.4
6	17.4	15.6	10.7	12.6	17.6	17.1	17.35	15.9	13.6	17.4	17.9	17.4
7	17.4	15.5	10.55	13.5	17.5	17.1	17.25	15.8	13.6	17.6	17.85	17.4
8	17.4	15.4	10.4	13.9	17.5	17.1	17.15	15.75	13.55	17.9	17.85	17.35
9	17.45	15.2	10.2	14.3	17.4	17.1	17.15	15.7	13.55	18.0	17.8	17.35
10	17.45	15.0	10.0	14.3	17.35	17.1	17.15	15.6	13.75	18.0	17.75	17.3
11	17.4	14.9	9.9	14.4	17.3	17.1	17.05	15.55	14.0	18.4	17.7	17.3
12	17.3	14.8	9.8	14.5	17.2	17.0	17.0	15.4	14.2	18.9	17.7	17.3
13	17.3	14.6	9.7	14.8	17.15	17.0	16.95	15.25	14.2	18.7	17.7	17.0
14	17.3	14.5	9.6	15.0	17.1	17.0	16.9	15.2	14.35	18.4	17.7	16.8
15	17.3	14.3	9.6	15.0	17.1	17.2	16.8	15.15	14.4	18.3	17.65	16.75
16	17.3	14.1	9.75	15.0	17.1	17.4	16.75	15.05	14.4	18.25	17.6	16.7
17	17.3	13.9	9.8	15.1	17.1	17.55	16.7	15.0	14.4	18.15	17.6	16.8
18	17.3	13.7	9.9	15.1	17.2	17.5	16.65	14.9	14.8	18.15	17.8	16.75
19	17.25	13.5	10.2	15.1	17.45	17.4	16.6	14.75	15.5	18.05	18.05	16.6
20	17.2	13.3	10.5	15.3	17.7	17.3	16.55	14.6	15.9	17.9	18.0	16.45
21	17.15	13.2	10.8	15.4	17.7	17.25	16.5	14.5	16.3	17.9	17.9	16.3
22	17.1	13.0	11.1	15.6	17.6	17.3	16.4	14.35	16.8	17.9	17.85	16.1
23	17.1	12.8	11.3	15.7	17.5	17.4	16.35	14.25	17.4	17.8	17.8	16.0
24	17.05	12.6	11.45	15.8	17.45	17.6	16.45	14.05	17.5	17.8	17.8	15.8
25	17.0	12.4	11.55	15.9	17.3	17.7	16.45	14.0	17.6	17.8	17.75	15.6
26	16.9	12.2	11.6	16.0	17.25	17.7	16.45	13.85	17.8	17.8	17.75	15.6
27	16.85	12.1	11.65	16.2	17.2	17.6	16.45	13.7	17.8	17.75	17.7	15.55
28	16.85	12.0	11.7	16.3	17.2	17.5	16.45	13.6	18.1	17.7	17.65	15.55
29	16.8	11.95	11.8	16.45	17.2	17.5	16.45	......	18.1	17.7	17.65	15.45
30	16.8	11.8	11.9	16.8	17.2	17.4	16.4	......	18.0	17.7	17.55	15.25
31	16.6	11.65	......	17.0	......	17.3	16.4	......	17.9	......	17.5	......

Daily discharge, in second-feet, of BEAVER RIVER AT STATE DAM, NEAR BEAVER RIVER, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	173	253	217	222	463	366	394	252	297	646	535	280
2......	207	252	216	222	809	366	429	251	297	552	535	280
3......	280	251	213	224	809	366	463	250	297	552	535	244
4......	244	250	212	225	714	338	429	250	297	854	630	207
5......	207	249	210	226	624	338	429	250	298	959	728	207
6......	207	248	208	228	624	293	429	250	298	553	728	207
7......	207	248	206	235	536	293	366	249	298	917	679	207
8......	207	247	205	238	536	293	315	249	298	1,260	679	173
9......	244	246	202	241	463	293	315	249	298	1,270	630	173
10......	354	245	200	241	429	293	315	248	299	1,140	582	139
11......	363	244	199	241	394	293	279	248	302	1,710	535	139
12......	295	244	197	242	338	265	265	265	303	2,700	535	192
13......	295	243	196	244	315	265	262	309	303	2,410	535	265
14......	295	242	194	245	293	265	259	309	304	1,730	535	257
15......	295	241	194	245	293	338	257	309	304	1,390	490	257
16......	295	240	196	245	293	463	257	309	304	1,330	427	256
17......	295	238	197	246	293	580	256	308	304	1,210	368	257
18......	295	237	199	246	338	536	254	307	307	1,210	552	257
19......	267	235	202	246	500	463	254	307	311	1,090	835	254
20......	239	233	206	247	714	394	254	306	314	846	777	252
21......	217	233	210	247	714	366	253	305	183	807	650	251
22......	195	231	213	248	624	394	252	304	4	807	601	250
23......	195	229	215	249	536	463	252	303	334	709	552	250
24......	181	228	216	249	500	624	252	303	503	709	552	249
25......	167	226	218	250	394	714	252	302	433	709	504	248
26......	161	224	218	250	366	714	252	301	642	709	504	248
27......	160	223	218	251	338	624	252	299	749	661	457	248
28......	160	222	219	251	338	536	252	298	1,110	584	412	248
29......	160	222	220	252	338	536	252	......	1,110	535	412	248
30......	229	220	221	257	338	463	252	......	990	535	324	246
31......	254	218	......	265	......	394	252	......	855	......	280	......
Mean...	237	237	208	242	475	417	299	282	418	1,040	552	233

Monthly discharge of BEAVER RIVER AT STATE DAM, NEAR BEAVER RIVER, for the year ended June 30, 1919

[Drainage area, 176 square miles]

MONTH	Discharge in Second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July..............................	363	160	237	1.35	1.56
August..............................	253	218	237	1.35	1.56
September..............................	221	194	208	1.18	1.32
October..............................	265	222	242	1.38	1.59
November..............................	809	293	475	2.70	3.01
December..............................	714	265	417	2.37	2.73
January..............................	463	252	299	1.70	1.96
February..............................	309	248	282	1.60	1.67
March..............................	1,110	4	418	2.38	2.74
April..............................	2,700	535	1,040	5.91	6.59
May..............................	835	280	552	3.14	3.62
June..............................	280	139	233	1.32	1.47
The year..............................	2,700	4	387	2.20	29.82

ST. LAWRENCE RIVER DRAINAGE BELOW LAKE ONTARIO

OSWEGATCHIE RIVER

DESCRIPTION

Oswegatchie river rises in Cranberry lake and the mountains to the southwest in St. Lawrence and Jefferson counties, whence it flows in a general northerly direction into the St. Lawrence river at Ogdensburg, where its drainage area is 1,609 square miles. The river is formed by the junction of the east branch of Oswegatchie river and the west branch of the Oswegatchie river at Talcville and its main tributary below this point is Indian river, which flows through Black lake. Considerable power is developed along all three of these main tributaries and many of the power sites in the lower reaches of the river have also been developed.

OSWEGATCHIE RIVER NEAR HEUVELTON

Location.— 2½ miles above Heuvelton, St. Lawrence county, 3 miles below Rensselaer Falls and 7 miles above the Indian river (outlet to Black lake).

Drainage area.— 961 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— June 23, 1916, to June 30, 1919.

Gage.— Gurley 7-day graph water-stage recorder on the right bank, about 2½ miles above Heuvelton, installed September 16, 1916. Prior to this date gage height was determined by measuring the distance from a reference point to the water-surface. Recorder inspected by George Todd.

Channel and control.— Solid rock.

Extremes of discharge.— Current year: Maximum stage from water-surface recorder, 5.94 feet at 1:30 A. M., March 21; discharge, 7,760 second-feet. Minimum stage from water-stage recorder, 0.95 foot at 4 A. M., August 24; discharge, 340 second-feet.

1916–1919: Maximum stage from water-stage recorder, 7.6 feet from 9 A. M to 12 A. M., March 30, 1917; discharge, 11,700

second-feet. Minimum stage from water-stage recorder, 0.91 foot at 11 P. M., October 16, 1916; discharge, 320 second-feet.

Ice.— Stage-discharge relation slightly affected by ice.

Regulation.— Some diurnal fluctuation due to mills at Rensselaer Falls and above. Seasonal flow regulated by storage in Cranberry lake.

Accuracy.— Stage-discharge relation permanent. Rating curve well defined between 400 and 15,000 second-feet. Stage-discharge relation affected by ice during a portion of the period from January to March. The operation of water-stage recorder satisfactory during the year. Daily discharge ascertained by applying mean daily gage height to rating table. Results good except for period when the stage-discharge relation was affected by ice, when results were fairly good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of OSWEGATCHIE RIVER NEAR HEUVELTON, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
Feb. 18	E. D. Burchard	2.13	1,320
June 12	C. C. Covert	1.63	846

Daily discharge, in second-feet, of OSWEGATCHIE RIVER NEAR HEUVELTON, for the thirteen months ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	800	446	452	1,370	3,530	2,460	2,820	1,460	1,520	2,250	2,820	1,300
2	791	426	440	1,260	3,530	2,320	2,820	1,120	2,180	2,530	3,050	1,160
3	800	520	404	1,190	3,370	2,250	2,820	947	2,460	2,600	3,130	1,070
4	966	510	459	1,080	2,900	2,180	2,980	956	2,600	2,600	3,050	947
5	863	496	513	1,100	2,600	1,910	3,050	966	2,900	2,980	3,870	909
6	686	480	499	2,690	2,390	1,550	2,460	976	2,750	3,620	4,830	863
7	600	490	492	5,100	2,110	1,720	2,040	947	2,390	4,470	4,920	1,690
8	555	400	485	6,050	1,980	1,720	1,750	836	2,110	5,290	4,650	1,490
9	562	440	492	6,050	1,840	1,800	1,720	719	1,910	5,480	4,040	1,120
10	728	541	472	5,100	1,650	1,900	2,040	686	2,320	5,670	3,450	1,110
11	861	719	520	4,120	1,590	1,800	1,980	755	3,210	5,860	2,980	966
12	947	863	492	3,290	1,510	1,780	1,780	686	3,370	6,450	2,750	827
13	938	800	446	2,600	1,390	1,780	1,410	622	3,050	7,050	2,600	755
14	854	622	446	2,110	1,370	2,580	1,200	740	2,750	7,470	2,460	654
15	800	555	420	1,910	1,310	4,720	1,260	1,850	2,600	7,280	2,180	638
16	719	555	459	1,730	1,230	6,050	1,290	2,040	2,180	7,050	2,040	622
17	615	541	472	1,540	1,190	6,250	1,270	1,510	3,730	6,850	1,910	646
18	615	520	534	1,430	1,680	5,860	1,270	1,300	6,250	7,050	2,110	670
19	600	485	555	1,320	3,390	4,740	1,260	1,200	7,260	6,450	2,320	615
20	622	466	938	1,290	4,920	3,780	1,100	1,100	7,470	5,480	2,320	570
21	593	492	1,170	1,410	5,670	3,050	1,020	985	7,260	4,650	2,390	592
22	555	459	1,420	1,680	5,860	2,600	1,080	968	5,860	4,040	2,750	600
23	513	398	1,840	1,910	5,670	2,980	1,090	890	4,830	3,370	2,750	555
24	506	355	1,730	1,840	4,830	3,210	1,750	1,190	3,960	2,900	2,980	527
25	459	398	1,740	1,750	3,960	2,980	2,460	1,280	3,210	2,600	2,750	562
26	433	420	1,780	1,780	3,130	2,750	2,250	1,270	2,820	2,460	2,530	609
27	440	392	1,980	2,180	2,600	2,680	2,040	1,220	2,600	2,390	2,390	4,120
28	420	420	1,840	2,460	2,180	2,180	1,980	1,070	2,600	2,250	2,180	5,670
29	445	446	1,590	2,320	2,180	2,180	1,780	......	2,600	2,390	1,910	5,100
30	459	443	1,510	2,180	2,460	2,110	1,630	......	2,250	2,680	1,660	3,870
31	485	4 2	......	2,680	......	2,600	1,460	......	2,040	......	1,470	......
Mean	653	502	886	2,400	2,800	2,850	1,830	1,080	3,390	4,470	2,810	1,340

NOTE.— Discharge, August 4 to 9, estimated by study of gage-height graph. Discharge, January 1 to 3, estimated by comparing with hydrograph of sum of East branch of Oswegatchie, Newton Falls, and West branch at Harrisville.

Monthly discharge of OSWEGATCHIE RIVER NEAR HEUVELTON, for the year ended June 30, 1919

[Drainage area, 961 square miles]

MONTH	Discharge in second-feet: Maximum	Minimum	Mean	Per square mile	Run-off: Depth in inches on drainage area
July	966	420	653	0.679	0.78
August	863	355	502	0.522	0.60
September	1,980	404	886	0.922	1.03
October	6,050	1,080	2,400	2.50	2.88
November	5,860	1,190	2,800	2.91	3.25
December	6,250	1,550	2,850	2.97	3.42
January	3,050	1,020	1,830	1.90	2.19
February	2,040	622	1,080	1.12	1.17
March	7,470	1,520	3,390	3.53	4.07
April	7,470	2,250	4,470	4.65	5.19
May	4,920	1,470	2,810	2.92	3.37
June	5,670	527	1,340	1.39	1.55
The year	7,470	355	2,084	2.17	29.50

EAST BRANCH OF OSWEGATCHIE RIVER AT NEWTON FALLS

Location.— 600 feet above the lower dam of the Newton Falls Paper Company in the village of Newton Falls, St. Lawrence county, 4 miles above the mouth of Little river and 10 below the outlet of Cranberry lake.

Drainage area.— 166 square miles. (Measured by engineers of the New York State Conservation Commission.)

Records available.— October 6, 1912, to June 30, 1919.

Gage.— Vertical staff on left bank about 600 feet above the lower dam; read by Henry Van Waldick.

Discharge measurements.— Made by wading at low stages and from a cable 30 feet above gage at high stages.

Channel and control.— Small boulders and rock, covered with waste from the pulp-mill; probably permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 5.23 feet at 6:20 P. M., April 13; discharge, 1,630 second-feet. Minimum stage is reached nearly every Sunday during low-water period, when paper mills shut down.

1912–1919. Maximum stage recorded, 6.1 feet at 5:15 P. M., March 28, 1913; discharge, 2,200 second-feet.

Ice.— Stage-discharge relation affected by ice only for short period during extremely cold weather.

Regulation.— Some diurnal fluctuation in flow caused by the paper-mills. Seasonal flow largely controlled by storage at Cranberry lake.

Accuracy.— Stage-discharge relation practically permanent. Not affected by ice during year. Rating curve well defined between 20 and 1,200 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying to the rating table weighted mean gage heights based on observer's notes concerning operation of paper-mills. Results good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of OSWEGATCHIE RIVER AT NEWTON FALLS, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		Feet	Sec.-ft.
July 17.......	J. W. Moulton....................................	2.09	318
July 17.......	J. W. Moulton....................................	1.99	296
July 17.......	J. W. Moulton....................................	1.98	295
July 17.......	J. W. Moulton....................................	1.93	301
1919			
June 9......	M. H. Carson....................................	1.71	252

Daily discharge, in second-feet, of EAST BRANCH OF OSWEGATCHIE RIVER AT NEWTON FALLS, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	326	304	20	445	338	282	490	315	272	810	588	252
2.....	293	304	338	430	376	430	475	293	272	770	571	144
3.....	20	350	376	460	282	315	460	554	350	894	538	293
4.....	20	326	338	282	402	460	445	304	338	982	350	293
5.....	326	326	338	475	389	460	282	363	350	938	658	326
6.....	20	326	338	852	402	282	445	252	326	658	658	304
7.....	20	293	338	770	430	402	506	293	350	810	694	293
8.....	376	350	130	658	304	57	460	272	293	810	694	272
9.....	262	326	338	506	326	416	460	293	292	810	732	242
10.....	475	350	376	326	57	430	460	315	389	982	658	272
11.....	293	137	293	293	272	460	522	338	363	1,170	658	293
12.....	376	326	350	252	293	430	252	315	338	1,330	252	315
13......	350	460	430	315	326	430	538	326	326	1,500	475	326
14.....	20	389	363	326	315	460	363	363	272	1,440	460	272
15.....	304	363	242	338	282	202	363	315	315	1,330	538	103
16.....	304	350	350	363	315	658	445	282	252	1,270	506	272
17.....	315	376	363	252	137	538	445	350	376	1,220	522	416
18.....	282	137	363	272	338	506	252	304	363	1,070	490	293
19.....	272	304	445	282	554	571	338	252	430	1,070	658	262
20.....	262	326	402	338	658	445	430	262	338	938	506	272
21.....	20	326	389	475	571	445	445	262	350	852	402	293
22.....	232	338	326	402	506	57	363	252	272	694	522	232
23.....	282	304	363	445	430	622	376	315	293	588	506	130
24.....	282	363	363	338	262	588	252	304	363	588	658	304
25.....	304	130	282	416	588	588	445	389	293	571	460	326
26.....	272	416	350	363	475	658	338	315	293	588	571	363
27.....	262	376	376	326	419	571	460	272	272	554	554	522
28.....	242	326	338	338	460	622	389	252	242	622	430	460
29.....	252	363	293	338	460	538	402	......	262	522	460	363
30.....	326	376	522	376	490	694	430	......	137	554	416	326
31.....	293	338	......	282	......	506	315	......	810	......	363	......
Mean...	248	325	338	398	382	456	408	312	329	898	534	294

Monthly discharge of EAST BRANCH OF OSWEGATCHIE RIVER AT NEWTON FALLS, for the year ended June 30, 1919

[Drainage area, 166 square miles]

Month	Discharge in Second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	475	20	248	1.49	1.72
August	460	130	325	1.96	2.26
September	522	20	338	2.04	2.28
October	852	252	398	2.40	2.77
November	658	57	382	2.30	2.57
December	694	57	456	2.75	3.17
January	538	252	408	2.46	2.84
February	554	252	312	1.88	1.96
March	810	137	329	1.98	2.28
April	1,500	522	898	5.41	6.04
May	732	252	534	3.22	3.71
June	522	103	294	1.77	1.98
The year	1,500	20	410	2.47	33.58

WEST BRANCH OF OSWEGATCHIE RIVER NEAR HARRISVILLE

Location.— At highway bridge near Geers Corners, 2½ miles downstream from Harrisville, Lewis county.

Drainage area.— 245 square miles. (Measured on topographic maps and map of New York issued by U. S. Geological Survey; scale 1:500,000.)

Records available.— July 1, 1916, to June 30, 1919.

Gage.— Vertical staff in three sections on the right bank; one section, graduated from 0.0 to 3.3 feet, about 25 feet below bridge, and two sections, graduated from 3.3 to 10.1 feet, on downstream side of bridge abutment. Gage read by Frank Osborne.

Discharge measurements.— Made from cable 200 feet upstream from bridge or by wading.

Channel and control.— Rocky and rough; probably permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 6.85 feet at 8 A. M., April 13; discharge, 3,360 second-feet. Minimum stage recorded, 1.1 feet at 7 A. M., August 28 and 29; discharge, 42 second-feet.

1916–1919: Maximum stage recorded, 8.1 feet at 6:30 A. M. and 6 P. M., March 28, 1917; discharge, 4,880 second-feet. Minimum stage recorded, 1.1 feet at 6 P. M., August 11, 1917, and 7 A. M., August 28 and 29, 1918; discharge, 42 second-feet.

Ice.— Stage-discharge relation probably not affected by ice.

Regulation.— Operation of pulp mill at Harrisville causes some diurnal fluctuation.

Accuracy.— Stage-discharge relation practically permanent. Not affected by ice. Rating curve well defined between 50 and 4,000 second-feet. Gage read to one-half tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurement of WEST BRANCH OF OSWEGATCHIE RIVER NEAR HARRISVILLE, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
June 9	M. H. Carson	2.04	175

Daily discharge, in second-feet, of WEST BRANCH OF OSWEGATCHIE RIVER NEAR HARRISVILLE, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	220	195	54	422	1,350	650	370	388	440	750	850	335
2	440	170	70	405	1,210	560	480	275	700	700	850	275
3	370	124	58	305	1,090	520	560	275	700	600	850	275
4	245	106	58	305	910	560	560	245	650	650	850	232
5	275	106	79	305	750	520	600	305	650	750	970	220
6	245	124	91	700	700	520	560	245	650	910	1,210	220
7	245	77	74	2,220	560	480	480	220	700	1,210	1,210	170
8	220	106	77	2,040	480	460	440	220	600	1,800	1,090	220
9	245	195	54	1,560	480	460	405	208	600	2,130	910	182
10	370	320	63	1,280	480	520	335	195	800	1,880	750	158
11	335	245	66	970	422	480	305	182	850	1,800	700	170
12	305	158	56	650	480	440	370	170	910	2,690	700	170
13	320	124	70	480	405	440	275	182	800	3,090	650	170
14	275	135	70	520	388	600	320	220	850	2,400	650	146
15	275	91	68	520	370	1,490	305	370	750	1,960	560	146
16	220	66	91	405	335	2,310	305	370	650	1,640	480	106
17	195	63	106	405	335	1,880	290	335	970	1,420	480	158
18	208	68	275	388	910	1,490	275	320	1,640	1,280	600	182
19	195	79	320	305	1,960	1,090	305	305	2,400	1,090	700	135
20	170	70	460	275	2,890	850	290	245	2,040	970	650	115
21	146	68	750	460	2,490	750	245	275	1,640	910	650	106
22	124	68	850	700	1,960	600	245	245	1,350	850	600	146
23	106	51	650	650	1,560	750	275	232	1,210	750	560	170
24	124	60	700	600	1,150	850	560	245	1,030	650	520	195
25	115	58	800	560	910	910	750	245	850	650	440	232
26	146	63	800	650	700	850	600	232	800	600	480	158
27	146	56	600	850	520	800	520	260	750	600	560	650
28	106	56	560	910	480	700	480	220	700	600	520	750
29	98	54	560	850	560	600	440	......	650	750	422	560
30	195	58	520	910	700	480	405	......	650	850	370	405
31	245	56	......	1,150	......	405	352	......	750	......	370	......
Mean	223	105	302	734	918	775	409	256	927	1,230	684	239

NOTE.— Stage-discharge relation not affected by ice.

Monthly discharge of WEST BRANCH OF OSWEGATCHIE RIVER NEAR HARRISVILLE, for the year ended June 30, 1919

[Drainage area, 245 square miles]

Month	Discharge in Second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	440	98	223	0.910	1.05
August	320	51	105	0.429	0.49
September	850	54	302	1.23	1.37
October	2,220	275	734	3.00	3.46
November	2,890	335	918	3.75	4.18
December	2,310	405	775	3.16	3.64
January	750	245	409	1.67	1.92
February	388	170	258	1.05	1.09
March	2,400	440	927	3.78	4.36
April	3,090	600	1,230	5.02	5.60
May	1,210	370	684	2.79	3.22
June	750	106	239	0.98	1.09
The year	3,090	51	567	2.31	31.47

RAQUETTE RIVER

DESCRIPTION

Raquette river rises in northern Hamilton county, flows almost north through a long narrow valley to St. Lawrence river. Its total length from its source to its confluence with the St. Lawrence, near the most northern point of the state, is 162 miles. The drainage area at the mouth of the river is 1,269 square miles.

Its source is on an elevated plateau about 1,600 feet above sea-level. The upper part of the basin includes many acres of swamp land, as well as a large area of lakes and ponds, including Tupper lake, Little Tupper lake, Long lake, Round lake, Blue Mountain lake, Forked lake and Raquette lake.

The high region receives a heavy rainfall, the mean annual amounting to about 48 inches, or about 10 inches above the mean for the state.

The course of the river through the mountains is marked by many falls and rapids, but as yet only 400 feet of the 1,400 feet of fall in the river below Tupper lake has been developed. The river is characterized by tremendous fluctuations between the maximum and minimum flow and is in great need of artificial regulation, if the possibilities of power development are to be fully realized.

RAQUETTE RIVER AT PIERCEFIELD

Location.— One-half mile below the dam of the International Paper Company at Piercefield, St. Lawrence county, and about ¾ mile above head of Black rapids.

Drainage area.— 723 square miles. (All but 16 square miles measured on U. S. Geological Survey topographic maps.)

Records available.— August 20, 1908, to June 30, 1919.

Gage.— Stevens water-stage recorder in a galvanized sheet-iron house over a concrete well on left bank about ½ mile below dam. Recorder inspected by M. O. Wood.

Discharge measurements.— Made from a cable ¾ mile below gage — just above Black rapids.

Channel and control.— Channel opposite gage is a deep pond with no perceptible velocity. Control point is at head of Black rapids.

Extremes of discharge.— Current year: Maximum stage recorded, 9.93 feet at 9 P. M., April 16; discharge, 5,170 second-feet. Minimum stage recorded, 2.2 feet at 3 P. M., September 15; discharge, 94 second-feet.

1908–1919: Maximum stage from water-stage recorder, 11.68 feet at 3 A. M., April 1, 1913; discharge, 7,100 second-feet. Minimum stage from water-stage recorder, 0.85 foot at 11 A. M., September 2, 1913; discharge, about 10 second-feet.

Ice.— Rapids that form control rarely freeze and measurements when the pond was covered with ice indicate that the stage-discharge relation is not often affected.

Regulation.— Large diurnal fluctuation in flow caused by dam during low and medium stages. Numerous lakes in the upper part of the drainage afford considerable storage, most of which is so controlled that the effect on the seasonal distribution of flow is large.

Accuracy.— Stage-discharge relation practically permanent. Not affected by ice. Rating curve well defined between 50 and 7,000 second-feet. Operation of the water-stage recorder satisfactory throughout the year. Daily discharge ascertained by discharge integration. Results good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State

Conservation Commission. Water-stage recorder inspected by an employee of the International Paper Company.

Daily discharge, in second-feet, of RAQUETTE RIVER AT PIERCEFIELD, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	854	865	235	1,280	2,410	1,550	1,690	1,010	620	2,300	3,440	1,910
2	1,250	765	259	1,260	2,780	1,920	1,690	409	306	2,380	3,360	2,080
3	1,200	740	370	1,240	2,680	1,800	1,690	575	734	2,480	3,160	1,940
4	782	485	523	1,190	2,980	1,720	1,660	890	963	2,500	3,290	1,880
5	962	565	387	1,160	2,880	1,590	1,210	900	580	2,520	3,400	1,810
6	1,270	740	328	1,440	2,880	1,510	1,560	918	683	2,310	3,340	1,700
7	824	713	204	2,180	2,780	1,590	1,560	895	900	2,700	3,560	1,590
8	964	710	117	2,500	2,590	1,150	1,490	800	791	2,840	3,410	1,260
9	1,260	746	273	2,780	2,500	1,520	1,510	827	411	3,060	3,300	1,510
10	1,210	677	417	2,900	2,240	1,490	1,490	892	787	3,400	3,240	1,320
11	1,260	421	407	2,900	2,410	1,420	1,380	580	990	3,610	2,890	1,210
12	1,240	838	408	2,770	2,410	1,390	650	580	868	3,990	2,940	1,200
13	1,280	830	408	2,510	2,240	1,360	1,100	545	925	4,300	2,820	1,190
14	830	867	385	2,590	2,150	1,360	1,310	598	963	4,600	2,750	1,130
15	1,330	862	154	2,430	2,070	896	1,280	750	975	4,900	2,800	963
16	1,380	845	278	2,270	1,990	1,390	1,230	416	867	5,010	2,760	854
17	1,330	835	458	2,170	1,570	1,460	1,200	648	923	5,030	2,790	937
18	1,350	523	414	2,080	1,900	1,490	1,280	755	1,160	5,090	2,710	960
19	1,290	775	453	1,940	2,070	1,490	1,240	780	1,230	5,010	2,710	938
20	1,380	845	531	1,820	2,070	1,460	545	680	1,260	5,020	2,680	870
21	898	785	532	1,860	2,150	1,420	720	560	1,430	4,910	2,670	600
22	1,400	710	300	1,840	2,240	960	690	560	1,580	4,820	2,630	278
23	1,380	695	401	1,760	2,320	1,490	880	303	1,420	4,670	2,650	452
24	1,110	657	614	1,760	1,990	1,440	1,160	600	1,820	4,560	2,610	652
25	1,100	277	780	1,660	2,240	1,360	1,180	820	1,950	4,290	2,570	622
26	1,110	417	1,070	1,660	2,240	1,800	1,140	640	2,020	4,180	2,680	624
27	960	417	1,070	1,590	2,070	1,870	520	598	2,070	4,030	2,590	665
28	640	340	1,110	1,720	1,720	1,840	927	627	2,210	3,900	2,530	556
29	895	285	950	1,720	2,030	1,460	940	......	2,220	3,760	2,420	256
30	983	205	1,290	1,870	1,990	1,840	1,100	......	1,980	3,610	2,320	......
31	975	160	......	2,070	......	1,760	990	......	2,240	......	2,220	......
Mean	1,120	632	504	1,970	2,290	1,510	1,190	648	1,210	3,860	2,880	1,070

NOTE.— Daily discharge estimated, because of no gage height record, January 12 and 13.

Monthly discharge of RAQUETTE RIVER AT PIERCEFIELD, for the year ended June 30, 1919

[Drainage area, 723 square miles]

MONTH	Discharge in Second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	1,400	640	1,120	1.55	1.79
August	867	160	632	0.874	1.01
September	1,290	117	504	0.697	0.78
October	2,900	1,160	1,970	2.72	3.14
November	2,980	1,570	2,290	3.17	3.54
December	1,920	896	1,510	2.09	2.41
January	1,690	520	1,190	1.60	1.84
February	1,010	303	648	0.896	0.93
March	2,240	306	1,210	1.67	1.92
April	5,090	2,300	3,860	5.34	5.96
May	3,560	2,220	2,880	3.98	4.59
June	2,080	256	1,070	1.48	1.65
The year	5,090	117	1,574	2.18	29.56

ST. REGIS RIVER

DESCRIPTION

St. Regis river has its source in several small streams and lakes in the western part of Franklin county at an elevation of about 1,500 feet above the sea. It first flows in a northwesterly direction for about 40 miles and then somewhat east of north for about 28 miles to its mouth, in the St. Lawrence river near the state line. Its drainage area comprises 664 square miles (State Water Supply Commission).

The upper portion of its watershed consists of swamp and of mountains, from which most of the forest has been cut. Upon leaving the plateau the stream descends for 10 or 15 miles through a rugged country by a succession of steep rapids and precipitous falls to the lowlands bordering the St. Lawrence. Only a few of the excellent opportunities for developing power in the descent have as yet been utilized. From the foot of the hills to the St. Lawrence, the slope of the river is moderate and rock outcrop not frequent, consequently favorable sites for power-plants are scarce.

ST. REGIS RIVER AT BRASHER CENTER

Location.—Near the steel highway bridge in the village of Brasher Center, St. Lawrence county, 5 miles downstream from Brasher Falls, 6¼ miles below junction of east and west branches of St. Regis river and about 12 miles above the mouth.

Drainage area.— 621 square miles. (Measured on post-route map.)

Records available.—August 22, 1910, to June 30, 1919.

Gages.— Staff, with inclined and vertical sections, on right bank about 600 feet above bridge. Installed June 24, 1916. Gage read by George Myers and Henry Shattuck.

Discharge measurements.— Made from a cable at the staff gage, installed in June, 1916. Previously made from the highway bridge or by wading.

Channel and control.— Small boulders and coarse gravel at cable; fairly permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 9.5 feet at 5 P. M., March 18; discharge, 5,850 second-feet. Mini-

mum stage recorded, 6.10 feet at 6 A. M., June 24, and 6 A. M. and 6 P. M., June 25; discharge, 340 second-feet.

1910–1919: Maximum stage recorded, 9.1 feet at 7 A. M., March 27, 1914; discharge, 16,200 second-feet. Minimum stage recorded, 5.25 feet, August 8, 1917; discharge, 34 second-feet.

Ice.— Stage-discharge relation seriously affected by ice.

Accuracy.— Stage-discharge relation practically permanent. Affected by ice during a large portion of the period from December to March, inclusive. Rating curves well defined between 200 and 6,000 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results good except for periods when the stage-discharge relation was affected by ice, when results were fairly good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements at ST. REGIS RIVER AT BRASHER CENTER, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
Jan. 9 *a*	E. D. Burchard	7.83	709
Feb. 17 *a*	E. D. Burchard	7.10	769
Mar. 8 *a*	E. D. Burchard	7.28	1,250
June 11	M. H. Carson	6.32	532

a Backwater present, due to ice.

Daily gage height, in feet, of ST. REGIS RIVER AT BRASHER CENTER, for the year ended June 30, 1919

DAY	Jan.	Feb.	Mar.	Apr.	May	June	DAY	Jan.	Feb.	Mar.	Apr.	May	June
1	8.7	6.8	6.9	7.5	7.5	6.55	16	7.45	7.2	7.2	8.1	6.9	6.38
2	8.7	6.75	7.4	7.4	7.45	6.5	17	7.2	7.1	7.7	8.5	6.85	6.36
3	8.7	6.75	7.5	7.35	7.4	6.42	18	7.15	7.15	9.4	8.2	7.1	6.49
4	8.7	6.85	7.6	7.3	7.2	6.31	19	7.2	7.1	8.4	8.0	7.25	6.44
5	8.6	6.95	8.5	7.3	8.0	6.20	20	7.1	6.9	8.3	7.8	7.0	6.39
6	8.7	6.85	7.6	7.4	8.3	6.22	21	6.95	6.9	8.3	7.5	6.95	6.26
7	8.7	6.85	7.45	8.4	8.1	6.25	22	6.85	6.9	8.1	7.35	6.9	6.21
8	8.8	6.8	7.4	8.6	7.8	6.21	23	6.95	6.85	8.0	7.45	7.15	6.19
9	7.8	6.8	7.35	8.5	7.5	6.34	24	7.4	6.9	7.9	7.4	7.5	6.11
10	7.8	6.7	7.6	8.4	7.3	6.30	25	7.3	6.85	7.7	7.15	7.35	6.10
11	8.2	6.65	7.8	8.5	7.4	6.31	26	7.4	6.85	7.8	7.2	7.4	6.16
12	8.1	6.7	7.7	9.1	7.35	6.28	27	7.35	6.8	7.7	7.1	7.25	7.0
13	7.7	6.7	7.6	8.9	7.35	6.30	28	7.2	6.8	7.8	7.2	7.2	7.35
14	8.2	6.8	7.3	8.6	7.05	6.34	29	7.1	.....	7.2	7.6	6.85	7.1
15	8.0	7.0	7.2	8.2	7.25	6.31	30	7.0	.....	7.35	7.6	6.65	6.7
							31	6.9	.....	7.35	.....	6.55	.....

Daily discharge, in second-feet, of St. Regis River at Brasher Center, for the year ended June 30, 1919

Day	Jan.	Feb.	Mar.	Apr.	May	June	Day	Jan.	Feb.	Mar.	Apr.	May	June
1	1,800	480	550	2,030	2,030	758	16	1,000	900	1,100	3,000	1,180	586
2	1,800	420	1,100	1,880	1,960	705	17	900	750	1,800	3,720	1,120	567
3	1,800	440	1,400	1,800	1,880	625	18	800	800	3.400	3,170	1,450	695
4	1,800	500	1,500	1,730	1,590	520	19	900	750	3,530	2,830	1,660	645
5	1,700	600	1,500	1,730	2,830	420	20	750	550	3,350	2,500	1,310	596
6	1,800	500	1,500	1,880	3,350	438	21	600	550	3,350	2,030	1,240	474
7	1,800	500	1,500	3,530	3,000	465	22	500	550	3,000	1,800	1,180	429
8	2,000	480	1,400	3,920	2,500	429	23	600	500	2,830	1,960	1,520	412
9	700	460	1,300	3,720	2,030	548	24	1,100	600	2,660	1,880	2,030	348
10	650	400	1,700	3,530	1,730	510	25	1,000	500	2,340	1,520	1,800	340
11	650	340	2,000	3,720	1,880	520	26	1,200	500	2,500	1,590	1,880	388
12	600	380	1,800	4,960	1,800	492	27	1,100	460	2,340	1,450	1,660	1,310
13	600	400	1,700	4,540	1,800	510	28	850	480	2,500	1,590	1,450	1,800
14	600	480	1,200	3,920	1,380	548	29	750	.....	1,590	2,180	1,120	1,450
15	800	650	1,100	3,170	1,660	520	30	650	.....	1,800	2,180	870	930
							31	600	.....	1,800	.....	758	.....
							Mean	1,050	533	1,970	2,650	1,730	633

NOTE.— Stage-discharge relation affected by ice, January 1 to March 18.

Monthly discharge of St. Regis River at Brasher Center, for the year ended June 30, 1919

[Drainage area, 621 square miles]

Month	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
January	2,000	500	1,050	1.69	1.95
February	900	340	533	0.858	0.89
March	3,530	550	1,970	3.17	3.66
April	4,960	1,450	2,650	4.27	4.76
May	3,350	758	1,730	2.79	3.22
June	1,800	340	633	1.02	1.14

LAKE CHAMPLAIN DRAINAGE BASIN

DESCRIPTION OF BASIN

Lake Champlain occupies a long and narrow valley, extending in a north-south direction and forming a part of the boundary between New York and Vermont.

Drainage areas tributary to LAKE CHAMPLAIN *

LOCALITY	AREA IN SQUARE MILES		
	Place to place	Sub-total	Total
Pike river and adjacent area in Canada	....	a 242.00	....
Missisquoi river in Canada	....	b 245.00	....
Land area in Canada above outlet	....	....	487.00
Missisquoi river in Vermont	....	b 615.00	....
(Total Missisquoi river, 860 square miles.)			
Lamoille river	....	b 725.00	....
Winooski river	....	b 995.00	....
Otter creek	....	b 935.00	....
Eastern coast drainage	....	b 534.40	....
Mettawee, Poultney and Castleton rivers in Vermont	....	c 376.00	....
Land area in Vermont, except islands	....	....	4,180.40
Wood creek above Smith's Basin	18.60	....	....
Big creek (Washington Co.) above junction with Wood creek	35.16	53.76	....
Wood creek, Smith's Basin to Fort Ann	9.90	63.66	....
Halfway creek above Kane's falls	78.82	....	....
Halfway creek, Kane's falls to junction with Wood creek at Fort Ann	6.69	85.51	....
Wood creek at Fort Ann, including Halfway creek	....	149.17	....
Wood creek, Fort Ann to junction with Mettawee	55.73	204.90	....
Mettawee river in Vermont	151.90	....	....
Mettawee river in New York	55.70	....	....
Total, Mettawee river	....	207.60	....
Total, Wood creek and Mettawee river at junction	....	412.50	....
Wood creek, junction Mettawee river to Whitehall	13.65	426.15	....
Wood creek, Whitehall to junction with Poultney river	1.65	427.80	....
Castleton river, in Vermont	100.90	....	....
Poultney river, including Castleton river in Vermont	....	254.80	....
Poultney river in New York	....	11.00	....
Poultney river, total to junction with Wood creek	....	265.80	....
Total, Wood creek and Poultney river at junction	....	....	693.60
Wood creek, Mettawee and Poultney rivers in New York	....	286.90	....
Lake George outlet	....	220.10	....
Bouquet river	....	c 268.10	....
Ausable river	....	d 521.30	....
Little Ausable river	....	d 75.10	....
Saranac river	....	d 629.60	....
Little Chazy river	....	c 63.80	....
Big Chazy river	....	d 299.40	....
Western coast drainage	....	d 344.60	....
Land area in New York, except islands	....	....	2,708.90
Islands in New York	....	e 55.20	....
Total land area above outlet	....	....	7,431.50
Water-surface in Canada	....	e 16.50	....
Water-surface in United States	....	e 419.10	....
Total water-surface	....	435.60	....
Total drainage area above outlet	....	....	7,867.10
Richelieu river, Rouses Point to Chambly	a 310.00	....	....
Total drainage area above Chambly	....	....	8,177.10
Richelieu river, Chambly to mouth	a 626.30	....	....
Richelieu river, total	....	936.30	....
Total drainage area above mouth	....	....	8,803.40

* Table here presented is a revision of that appearing in the 1917 report. *a* From maps of Canadian Geological Survey. Scale: 1 inch = 4 miles. *b* United States post-route maps. Scale: 1 inch = 12.5 miles. *c* Topographic maps of U. S. G. S. Scale: 1 inch = 1 mile (nearly). *d* Bien's Atlas of New York. Scale: 1 inch = 2.5 miles. *e* Charts of U. S. Coast and Geodetic Survey. Scale: 1:40,000.

The drainage basin is irregular in form, being about seventy-five miles wide from a point opposite Middlebury, Vt., northward to the outlet of the lake at Rouses Point, on the international boundary. South of Middlebury the average width of the basin is about thirty-five miles and the lake itself is very narrow, forming virtually a drowned river.

The tributary region is rugged and mountainous, mostly covered with forest and with little depth of soil except in the stream valleys. The drainage is received almost entirely through large tributaries, there being little direct coast drainage into the lake. The outlet of the lake is Richelieu river, which flows northward from Rouses Point to St. Lawrence river. The land drainage area above Rouses Point is 7,431 square miles. The water-surface of the lake is 436 square miles, making the total area at the foot of the lake 7,867 square miles.

The fluctuation of the lake surface has an extreme range of nearly ten feet.

LAKE CHAMPLAIN

Records showing the water-surface of Lake Champlain are kept at Fort Montgomery and Burlington by the United States Government and at Whitehall by the State of New York. The Government elevations are referred to mean sea-level at Sandy Hook, while the State elevations, Barge canal datum, are referred to mean tide at New York, which is taken as 14.73 feet below the Greenbush bench-mark. The relation between the two sets of elevations in this region is shown by the following determinations of the elevation of the old bench-mark at Whitehall, described as, "U. S. D. W. B. M., on coping of lock No. 23, between ends of anchor, N. W. gate, marked (cross in circle) U. S., with chisel," which is New York State Canal B. M. No. 130 and United States Coast and Geodetic Survey B. M. No. 36.

	Feet
Elevation (New York State Barge canal datum)....	104.375
Elevation (United States Coast and Geodetic Survey datum)	103.565
Difference	0.81

Therefore, to convert elevations in this region given by the United States Coast and Geodetic Survey or by the United States Engineers (War Department), referred to mean sea-level, to elevations referred to Barge canal datum, add 0.81 foot. It is to be noted that the similar relation at Albany is 0.87 foot.

LAKE CHAMPLAIN AT WHITEHALL

Gage No. 126

A gage has been maintained by this Department in the mouth of Wood creek below the dam at Whitehall since January 22, 1905. This gage gives a record of fluctuation in level of water in this arm of Lake Champlain, which, however, is considerably affected by Wood creek discharges.

The original gage was attached to the face of the Champlain silk-mill on the right side of the stream below the dam. A standard Type A gage, No. 126, secured to the upper end of the lower east gate recess and having a range of 4 feet, between elevation 93.0 and 97.0, was superseded on December 20, 1917, by a standard Type A gage, in two sections. The lower section, having a range of 8 feet, between elevations 93.0 and 101.0, is secured to the north face of the lower west approach wall. A standard bench-mark plug is set in the wall near this section at elevation 100.0 (B. C. datum). The upper section, having a range of 4 feet, between elevations 101.0 and 105.0, is secured to the north face of the lower east thrust wall. A standard bench-mark plug is set near this section at elevation 104.0 (B. C. datum).

The gage is read twice daily — morning and afternoon — to tenths, with occasional readings to half-tenths.

This record was published as "Wood creek below Dam at Whitehall" previous to 1914.

Daily elevation of water-surface (B. C. datum) of LAKE CHAMPLAIN AT WHITEHALL, for the year ended June 30, 1919. W. J. Berry and H. Pfandler, Observers.

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	96.40	95.55	95.12	96.18	98.25	98.50	97.60	96.95	99.10	98.80	99.25	98.40
2	96.60	95.20	94.95	95.72	98.45	98.15	97.80	97.00	97.40	98.30	99.20	98.32
3	96.55	95.35	94.58	96.25	98.50	98.00	98.00	96.90	96.40	98.15	99.20	98.30
4	96.80	95.32	94.55	95.92	98.48	98.25	98.00	96.80	96.25	98.35	99.45	98.10
5	96.50	95.25	94.65	96.15	98.85	98.05	97.70	96.80	96.35	98.35	99.45	98.10
6	96.30	95.40	94.95	96.80	98.40	98.05	97.70	96.70	96.60	98.35	99.40	97.80
7	96.45	95.35	95.20	97.95	97.90	97.85	97.50	96.68	96.42	98.50	99.08	98.00
8	96.40	95.50	95.05	97.45	98.55	97.75	97.45	96.60	96.45	98.85	99.62	97.75
9	96.22	95.65	95.05	97.38	97.75	97.95	97.40	96.60	96.80	99.30	99.45	97.65
10	96.28	95.55	95.30	97.60	98.10	97.95	97.60	96.60	97.30	98.85	99.10	97.65
11	96.32	95.10	95.00	97.65	98.22	97.65	97.60	96.60	96.85	98.80	99.20	97.90
12	96.38	95.50	94.70	97.48	98.00	97.55	97.40	96.60	96.60	99.75	99.15	97.55
13	96.35	95.30	94.75	97.38	97.55	97.50	97.40	96.60	96.90	99.90	98.95	97.45
14	96.40	95.55	94.70	97.72	97.85	97.35	97.40	96.60	96.95	100.10	98.90	97.35
15	96.20	95.60	94.80	97.75	97.70	97.55	97.30	96.60	96.75	100.20	98.75	97.35
16	96.20	95.70	94.65	97.55	97.65	97.85	97.30	96.50	96.55	100.00	98.40	97.28
17	96.28	95.70	94.70	97.50	97.65	98.05	97.20	96.45	96.60	100.10	98.50	97.45
18	96.32	95.70	94.92	98.08	97.80	98.00	97.10	96.40	96.75	100.15	98.58	97.35
19	96.15	95.55	94.80	97.55	98.95	97.75	97.20	96.40	97.05	100.20	98.45	97.20
20	96.10	95.42	94.82	96.90	98.85	97.65	97.15	96.35	97.18	99.85	98.55	97.35
21	96.00	95.30	95.15	97.08	98.80	97.60	97.05	96.25	97.35	100.55	98.45	97.40
22	95.80	95.42	94.60	97.55	98.80	97.55	96.80	96.20	97.75	100.10	98.90	97.60
23	95.75	95.22	95.25	97.40	98.72	97.72	96.80	96.15	97.90	99.95	98.90	96.88
24	95.72	95.12	95.28	97.38	98.45	97.78	97.70	96.10	98.00	99.60	98.75	96.90
25	95.65	95.30	95.20	96.98	98.40	97.95	97.40	96.00	97.60	99.95	98.90	96.65
26	95.52	95.12	95.55	97.20	98.85	98.05	97.10	96.00	97.45	99.55	98.90	96.48
27	95.35	95.62	96.35	97.25	97.95	97.98	97.00	96.05	97.40	99.60	99.10	96.85
28	95.80	94.88	95.45	96.90	98.20	97.95	97.05	96.00	98.45	99.25	98.90	97.30
29	95.68	94.65	96.15	96.48	98.15	98.00	97.00	......	98.70	99.70	98.65	96.68
30	95.50	94.95	95.95	97.50	98.18	97.80	97.00	......	98.65	99.75	98.80	96.60
31	95.92	94.75	......	98.38	......	97.70	97.00	......	98.80	......	98.60	......

LAKE CHAMPLAIN AT BURLINGTON, VT.

Location.— On south side of roadway leading to dock of Champlain Transportation Co., at foot of King street, Burlington, Vt.

Records available.— May, 1907, to June 30, 1919.

Gage.— Staff; read once daily. Comparisons of gage readings indicate that zero of gage at Burlington is at practically the same elevation as that of gage at Fort Montgomery — 92.50 feet above mean sea-level (Elev. 93.31 B. C. datum).

Extremes of stage.— Current year: Maximum stage recorded, 6.70 feet on April 19. Minimum stage recorded, 1.44 feet, September 14.

1907–1919: Maximum stage recorded, 8.20 feet on April 7, 1913. Minimum stage recorded, 0.25 foot on December 4, 1908.

Coöperation.— Gage heights furnished through the courtesy of Mr. D. A. Loomis, general manager of the Champlain Transportation Company to the United States Geological Survey.

Daily gage height, in feet, of LAKE CHAMPLAIN AT BURLINGTON, VERMONT, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	*a*	2.18	*a*	2.75	4.75	*a*	*a*	3.47	2.56	4.82	*a*	*a*
2.....	3.19	*a*	1.52	*a*	4.95	*a*	4.20	*a*	*a*	4.80	5.80	4.85
3.....	*a*	*a*	*a*	2.74	*a*	4.75	4.30	3.43	2.68	4.77	5.76	4.79
4.....	*a*	2.08	*a*	*a*	4.95	4.70	*a*	*a*	2.76	4.78	*a*	4.74
5.....	3.04	*a*	*a*	3.00	5.00	*a*	*a*	3.30	2.82	4.80	5.68	4.60
6.....	*a*	1.92	*a*	*a*	4.97	4.62	*a*	*a*	2.88	*a*	5.82	*a*
7.....	*a*	1.92	1.60	3.65	*a*	*a*	*a*	3.22	2.96	4.90	*a*	*a*
8.....	*a*	*a*	*a*	4.06	4.80	*a*	4.12	*a*	2.98	5.22	5.70	*a*
9.....	*a*	2.09	*a*	4.15	*a*	4.35	*a*	*a*	*a*	5.47	5.74	*a*
10.....	2.93	*a*	*a*	4.24	*a*	4.30	*a*	3.10	3.02	*a*	5.67	4.33
11.....	2.89	*a*	1.50	4.22	4.72	*a*	*a*	*a*	3.12	5.50	*a*	4.22
12.....	2.84	2.14	*a*	*a*	4.60	*a*	*a*	3.00	3.14	5.93	5.57	4.16
13.....	*a*	*a*	*a*	*a*	*a*	4.13	*a*	2.97	*a*	*a*	5.45	4.06
14.....	*a*	*a*	1.44	*a*	4.42	*a*	3.68	*a*	*a*	6.50	5.38	3.97
15.....	2.78	2.10	*a*	*a*	*a*	*a*	*a*	*a*	3.24	6.58	5.25	*a*
16.....	*a*	2.08	1.49	4.10	4.22	4.33	*a*	*a*	*a*	6.60	*a*	3.96
17.....	2.72	*a*	*a*	4.02	*a*	4.43	3.75	2.86	3.14	6.65	*a*	3.90
18.....	2.71	*a*	*a*	*a*	4.30	4.38	3.72	2.82	3.20	6.67	*a*	3.88
19.....	*a*	2.02	*a*	*a*	4.67	*a*	*a*	*a*	3.37	6.70	5.07	*a*
20.....	*a*	1.98	1.67	*a*	5.02	*a*	*a*	2.74	3.46	*a*	5.07	3.80
21.....	2.60	*a*	1.70	*a*	5.22	*a*	3.60	2.70	3.70	6.60	5.02	*a*
22.....	*a*	1.92	*a*	3.93	5.28	*a*	*a*	*a*	3.87	6.58	4.95	*a*
23.....	2.52	1.86	1.76	3.95	*a*	4.12	*a*	*a*	*a*	*a*	*a*	*a*
24.....	2.48	*a*	1.82	*a*	*a*	*a*	3.55	2.60	4.07	6.36	5.30	3.50
25.....	*a*	*a*	1.89	*a*	*a*	*a*	*a*	2.56	4.10	*a*	*a*	*a*
26.....	2.30	*a*	2.06	3.90	5.15	*a*	*a*	2.58	4.10	6.22	5.33	3.25
27.....	2.20	1.75	2.16	*a*	*a*	*a*	*a*	*a*	4.10	6.12	5.31	3.27
28.....	*a*	*a*	2.46	*a*	*a*	4.37	*a*	2.48	4.28	6.06	5.26	*a*
29.....	2.20	*a*	*a*	3.90	4.90	*a*	*a*	......	4.60	6.02	5.19	*a*
30.....	*a*	1.54	2.76	4.10	*a*	4.33	3.59	......	*a*	5.96	*a*	3.16
31.....		*a*	......	4.40	......	4.30	*a*	......	4.78	......	5.06	......

a No record.

RICHELIEU RIVER AT FORT MONTGOMERY, ROUSES POINT

Location.— Inside the fort, ⅜ mile south of the international boundary, about ½ mile above head of Richelieu river, the outlet of Lake Champlain, and 1 mile northeast of the village of Rouses Point, Clinton county.

Drainage area.— 7,870 square miles, including 436 miles of water-surface (from annual report of New York State Engineer and Surveyor).

Records available.— 1875 to 1919.

Gage.— Staff, inside the fort. Elevation of gage zero, 92.50 feet above mean sea-level; read by Thomas Bourke.

Extremes of stage.— Current year: Maximum elevation recorded, 99.15 feet at 10 A. M. on April 20. Minimum elevation recorded, 93.65 feet at 10 A. M., September 10.

1869–1919: Maximum elevation recorded, 103.28 feet in April, 1869.* Minimum elevation recorded, 91.9 feet, November 13, 1908.

Coöperation.— Gage heights observed under direction of the corps of engineers of the United States Army and reported weekly to the United States Geological Survey.

* Hoyt, J. C., Stream Measurements, 1903, North Atlantic, St. Lawrence river and Great Lakes Drainage: U. S. Geological Survey Water-Supply paper 97, page 340, 1904.

Daily gage height, in feet, of RICHELIEU RIVER AT FORT MONTGOMERY, ROUSES POINT, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	2.95	1.9	1.4	2.35	4.35	4.35	3.85	3.15	2.15	4.35	5.5	4.6
2.....	2.9	1.9	1.45	2.6	4.55	4.4	3.8	3.1	2.3	4.4	5.58	4.57
3.....	2.9	1.75	1.55	2.4	4.6	4.35	3.85	3.05	2.3	4.45	5.37	4.44
4.....	2.85	1.8	1.3	2.45	4.6	4.25	3.85	3.0	2.45	4.4	5.3	4.35
5.....	2.8	1.85	1.4	2.6	4.55	4.2	3.85	2.95	2.4	4.4	5.3	4.3
6.....	2.8	1.65	1.3	2.9	4.6	4.1	3.85	2.95	2.5	4.45	5.3	4.25
7.....	2.75	1.7	1.3	3.3	5.0	4.45	3.9	2.9	2.55	4.6	5.7	4.1
8.....	2.7	1.65	1.3	3.6	4.4	4.2	3.9	2.85	2.55	4.8	5.2	4.18
9.....	2.75	1.7	1.3	3.85	5.4	4.0	3.9	2.8	2.65	4.95	5.23	4.22
10.....	2.65	1.8	1.15	3.9	4.3	3.85	3.85	2.75	2.7	5.5	5.2	4.05
11.....	2.65	2.1	1.2	3.9	4.25	4.15	3.8	2.7	2.7	5.3	5.15	3.9
12.....	2.6	1.85	1.5	3.9	4.25	4.3	3.7	2.65	2.75	5.55	5.05	3.95
13.....	2.55	1.9	1.25	4.05	4.55	3.8	3.65	2.6	2.8	6.05	5.05	3.85
14.....	2.5	1.85	1.2	3.8	4.1	4.05	3.6	2.6	2.8	6.2	5.0	3.82
15.....	2.5	1.8	1.2	3.7	4.15	3.75	3.5	2.55	2.8	6.3	4.88	3.75
16.....	2.5	1.7	1.2	3.75	3.95	3.95	3.5	2.5	2.9	6.4	4.86	3.67
17.....	2.45	1.7	1.2	3.65	3.95	3.8	3.45	2.45	2.9	6.45	4.85	3.6
18.....	2.4	1.7	1.2	3.55	3.9	3.95	3.4	2.4	3.0	6.4	4.73	3.53
19.....	2.4	1.65	1.3	3.6	4.25	3.95	3.35	2.4	3.05	6.4	4.75	3.57
20.....	2.35	1.7	1.3	4.25	4.6	4.05	3.3	2.35	3.15	6.65	4.72	3.5
21.....	2.3	1.65	1.35	3.65	4.85	3.85	3.2	2.35	3.25	6.2	4.65	3.38
22.....	2.3	1.6	1.4	3.55	4.85	4.15	3.25	2.3	3.3	6.3	4.6	3.25
23.....	2.3	1.65	1.5	3.6	4.9	3.8	3.2	2.3	3.45	6.25	4.87	3.32
24.....	2.2	1.55	1.5	3.6	4.95	3.8	3.15	2.2	3.5	6.2	4.92	3.2
25.....	2.25	1.55	1.65	3.75	4.85	3.95	3.2	2.25	3.7	6.0	4.93	3.08
26.....	2.25	1.6	1.75	3.6	4.65	4.0	3.25	2.15	3.8	6.05	4.92	3.12
27.....	2.15	1.45	1.95	3.65	4.6	3.95	3.25	2.1	3.85	5.85	4.88	2.94
28.....	1.95	1.55	2.35	3.8	4.7	3.85	3.2	2.1	3.9	5.8	4.88	2.87
29.....	2.0	1.8	2.2	3.65	4.6	3.9	3.2	......	3.95	5.55	4.81	2.83
30.....	2.0	1.35	2.3	3.7	4.6	3.9	3.15	......	4.2	5.5	4.67	2.82
31.....	1.85	1.45	......	4.1	......	3.85	3.15	......	4.3	......	4.65	......

WOOD CREEK

DESCRIPTION

Wood creek proper rises among the hills in the central part of Washington county, at an elevation of about 300 feet, and flows in a general northerly direction, entering Lake Champlain at Whitehall. It has a number of tributaries, the two larger on the east being Big creek, also called East creek, which enters at Smith's Basin, and Mettawee river, which enters about 1½ miles above Whitehall. Big creek rises in the central part of Washington county at an elevation of about 1,000 feet, descending rapidly for a short distance to South Hartford, then falling slowly to Smith's Basin. Mettawee river is an interstate stream, rising in Dorset mountains, Vermont, crossing the State line into New York at Granville and entering Wood creek about 1½ miles above Whitehall. The drainage basin is a rugged area of rock mostly forest covered and tributaries are rather numerous and branching, there being no lakes or marshes. The principal tributary on the west is Halfway creek, entering Wood creek near Fort Ann. This creek with its tributaries is the outlet of Glen lake and several smaller lakes and ponds in the hilly region to the north of Glens Falls.

Wood creek flows through a by-pass at lock No. 9, passing over a concrete spillway that has a crest length of 50 feet at elevation 131.0 and enters the lower pool of the Barge canal just below lock No. 9. From this point to Lake Champlain it has been canalized as a part of the Barge canal system.

WOOD CREEK ABOVE DAM AT SMITH'S BASIN

Gage No. 122

This station, established October 24, 1916, gives pool elevations spillway at lock No. 9. The gage, No. 122, is a standard Type A gage, having a range of 6 feet, between elevations 132.0 and 138.0, secured to the west wing of the spillway. A standard bench-mark plug is set near the gage at elevation 137.0 (B. C. datum).

It is read twice daily — 6 A. M. and 4 or 6 P. M.— to hundredths.

Daily elevation of water-surface (B. C. datum) of WOOD CREEK ABOVE DAM AT SMITH'S BASIN, for the year ended June 30, 1919. G. H. Barrett, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	132.60	132.50	132.65	132.85	133.08	132.74	132.88	132.78	133.85	132.90	132.69	132.65
2.....	132.60	132.50	132.65	132.80	132.92	132.70	133.16	132.80	133.48	132.88	132.82	132.65
3.....	132.60	132.51	132.65	132.76	132.80	132.69	132.92	132.75	133.10	132.92	132.85	132.72
4.....	132.60	132.50	132.65	132.75	132.79	132.69	132.82	132.72	133.00	132.98	132.72	132.70
5.....	132.59	132.50	132.60	132.71	132.85	132.70	132.90	132.69	133.00	133.08	132.78	132.62
6.....	132.60	132.50	132.59	132.82	132.80	132.68	132.95	132.65	132.92	132.98	132.78	132.62
7.....	132.66	132.50	132.60	132.86	132.76	132.65	132.90	132.65	132.88	132.94	132.74	132.65
8.....	132.64	132.50	132.60	132.88	132.76	132.65	132.85	132.64	132.80	132.86	132.85	132.65
9.....	132.65	132.54	132.60	132.79	132.75	132.65	132.79	132.65	133.40	132.86	132.80	132.70
10.....	132.64	132.59	132.60	132.76	132.75	132.70	132.78	132.64	133.74	132.84	132.78	132.75
11.....	132.64	132.58	132.59	132.70	132.74	132.70	132.78	132.62	133.14	132.88	132.80	132.80
12.....	132.64	132.56	132.58	132.69	132.72	132.69	132.85	132.60	132.97	133.48	132.75	132.70
13.....	132.61	132.54	132.58	132.70	132.70	132.66	132.76	132.60	132.88	133.25	132.75	132.68
14.....	132.62	132.57	132.62	132.70	132.70	132.66	132.74	132.62	132.84	132.95	132.72	132.65
15.....	132.65	132.55	132.64	132.70	132.70	133.05	132.70	132.72	132.78	132.84	132.68	132.65
16.....	132.66	132.56	132.61	132.69	132.69	133.10	132.66	132.80	132.85	132.82	132.68	132.68
17.....	132.66	132.55	132.64	132.68	132.68	132.95	132.66	132.80	133.15	133.28	132.80	132.70
18.....	132.66	132.55	132.64	132.66	132.85	132.82	132.65	132.75	133.09	133.02	133.05	132.65
19.....	132.64	132.54	132.71	132.66	134.18	132.75	132.70	132.70	133.14	132.90	132.68	132.62
20.....	132.64	132.55	132.72	132.65	133.45	132.72	132.70	132.69	132.98	132.80	132.80	132.60
21.....	132.62	132.55	132.92	132.66	133.10	132.68	132.66	132.65	133.15	132.78	132.78	132.60
22.....	132.60	132.52	132.98	132.66	132.98	132.69	132.68	132.65	133.12	132.68	133.28	132.60
23.....	132.59	132.50	132.97	132.68	132.89	133.38	132.77	132.62	132.82	132.68	133.32	132.60
24.....	132.60	132.49	132.80	132.66	132.84	133.16	133.62	132.65	132.80	132.70	132.95	132.60
25.....	132.58	132.53	132.80	132.66	132.79	133.35	133.02	132.65	132.79	132.72	132.95	132.60
26.....	132.56	132.48	133.20	132.66	132.75	133.30	133.05	132.70	132.78	132.70	132.98	132.60
27.....	132.56	132.46	133.85	132.72	132.73	133.00	132.88	132.85	132.79	132.70	132.92	132.65
28.....	132.55	132.45	133.30	132.74	132.72	132.88	132.85	132.90	133.78	132.68	132.78	132.62
29.....	132.54	132.40	133.01	132.71	132.75	132.85	132.86	......	133.00	132.70	132.78	132.60
30.....	132.50	132.40	132.92	132.72	132.74	132.85	132.82	......	133.05	132.69	132.72	132.60
31.....	132.52	132.40	......	133.22	......	*a*	132.80	......	132.88	......	132.70	......

a No record.

BARGE CANAL ABOVE LOCK No. 9, AT SMITH'S BASIN

Gage No. 120

This station, established October 24, 1916, gives pool elevations on the summit level between locks Nos. 8 and 9. The gage, No. 120, is a standard Type A gage, having a range of 4 feet, between elevations 137.0 and 141.0, secured to the east lock wall at the upper end of the upper gate recess. A standard bench-mark plug is set near the gage at elevation 142.0 (B. C. datum).

The gage is read twice daily — 6 A. M. and 4 or 6 P. M. — to hundredths. During the winter the water drops below the gage, the supply from the Glens Falls feeder being shut off.

Daily elevation of water-surface (B. C. datum) of BARGE CANAL ABOVE LOCK No. 9, AT SMITH'S BASIN, for the year ended June 30, 1919. G. H. Barrett, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	139.42	139.42	139.72	138.92	139.28	139.12	......	......	......	......	138.60	138.92
2	139.06	139.50	139.59	139.28	139.20	138.98	......	......	......	......	138.45	139.20
3	139.10	139.45	139.78	139.22	139.12	138.92	......	......	......	......	138.38	139.10
4	139.82	139.55	139.92	139.18	139.12	139.12	......	......	......	......	139.35	139.00
5	139.85	139.55	139.78	139.18	139.15	139.10	......	......	......	......	139.25	139.00
6	139.78	139.48	139.30	139.25	139.22	139.25	......	......	......	......	139.30	139.25
7	139.65	139.50	139.28	139.52	139.14	138.95	......	......	......	......	139.25	139.35
8	139.45	139.52	139.42	139.20	139.08	139.10	......	......	......	......	139.35	138.92
9	139.58	139.80	139.85	139.38	139.05	138.68	......	......	......	......	139.00	139.20
10	139.38	139.78	139.62	139.32	138.98	138.55	......	......	......	......	139.00	139.20
11	139.28	139.95	139.75	139.30	139.05	138.22	......	......	......	......	139.15	139.28
12	139.62	139.54	139.96	139.40	139.20	137.10	......	......	......	......	139.30	139.25
13	139.38	139.40	139.54	139.22	139.22	135.41	......	......	......	......	139.05	139.15
14	139.72	139.25	139.80	139.32	138.90	130.20	......	......	......	......	139.00	139.15
15	139.65	139.40	140.02	139.30	138.65	129.08	......	......	......	......	138.95	138.95
16	139.78	139.35	139.55	139.20	138.65	129.35	......	......	......	......	138.85	139.10
17	139.68	139.18	139.75	139.30	138.70	129.05	......	......	......	......	139.00	139.40
18	139.40	139.08	139.85	139.20	139.22	128.85	......	......	......	......	139.30	139.10
19	139.48	139.05	139.70	139.15	138.92	128.60	......	......	......	......	138.75	139.00
20	139.58	138.92	140.00	139.10	138.78	128.50	......	......	......	......	139.30	139.05
21	139.70	138.65	139.43	138.90	138.98	128.50	......	......	......	......	139.15	138.95
22	139.75	138.62	139.80	138.90	139.25	128.45	......	......	......	137.95	138.85	138.93
23	139.50	138.25	139.85	138.80	138.80	129.00	......	......	......	138.78	139.10	139.25
24	139.58	138.70	139.55	138.52	138.82	......	......	......	......	139.20	139.15	139.28
25	139.66	138.72	139.25	138.75	139.05	......	......	......	......	139.40	139.10	139.40
26	139.80	138.72	139.48	139.02	139.25	......	......	......	......	138.80	139.25	139.35
27	139.42	138.55	139.00	139.10	139.30	......	......	......	......	138.90	139.15	139.00
28	139.55	138.80	139.28	139.29	139.02	......	......	......	......	138.85	139.20	138.88
29	139.50	138.75	139.15	139.16	138.72	......	......	......	......	138.85	139.15	138.72
30	139.25	139.15	139.52	139.26	138.90	......	......	......	......	138.85	139.30	138.75
31	139.18	139.38	......	139.12	......	......	......	......	......	......	139.40	......

NOTE.— Water below gage from December 23 to April 21, inclusive; no record.

WOOD CREEK BELOW LOCK No. 9, AT SMITH'S BASIN

Gage No. 121

This station, established October 24, 1916, gives the elevation of the lower pool at lock No. 9. The gage, No. 121, a standard Type A gage, having a range of 4 feet, between elevations 123.0 and 127.0, secured to the east lock wall at the upper end of the lower gate recess, was superseded on November 20, 1917, by a standard Type A gage, secured to the north end of the lower east approach wall. The gage has a range of 8 feet, between elevations 123.0 and 131.0. A standard bench-mark plug is set in the wall near the gage at elevation 130.0 (B. C. datum).

The gage is read twice daily — 6 A. M. and 4 or 6 P. M. — to hundredths.

Daily elevation of water-surface (B. C. datum) of WOOD CREEK BELOW LOCK No. 9, AT SMITH'S BASIN, for the year ended June 30, 1919. G. H. Barrett, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	124.36	124.32	124.48	124.55	124.92	124.55	124.38	124.42	126.80	124.75	124.58	124.40
2	124.42	124.28	124.45	124.48	124.70	124.38	125.32	124.32	125.78	124.66	124.80	124.40
3	124.65	124.25	124.48	124.50	124.58	124.50	124.95	124.28	125.20	124.65	124.88	124.58
4	124.40	124.32	124.38	124.48	124.64	124.48	124.55	124.26	124.85	125.00	124.68	124.55
5	124.38	124.30	124.32	124.40	124.65	124.50	124.50	124.22	124.92	125.10	124.65	124.38
6	124.35	124.32	124.38	124.61	124.60	124.50	124.45	124.20	124.78	124.90	124.68	124.45
7	124.45	124.35	124.38	124.35	124.50	124.48	124.45	124.20	124.70	124.85	124.80	124.55
8	124.42	124.28	124.38	123.78	124.50	124.42	124.50	124.20	124.55	124.84	124.88	124.62
9	124.40	124.35	124.40	124.10	124.45	124.45	124.48	124.20	125.62	124.81	124.62	124.65
10	124.36	124.38	124.28	123.28	124.45	124.42	124.48	124.18	126.32	124.72	124.75	125.02
11	124.58	124.35	124.30	124.25	124.48	124.38	124.50	124.15	125.22	124.62	124.80	124.78
12	124.50	124.32	124.32	124.38	124.48	124.36	124.48	124.15	124.88	126.10	124.85	124.65
13	124.45	124.38	124.30	124.45	124.45	124.40	124.45	124.15	124.78	125.25	124.72	124.48
14	124.42	124.30	124.32	124.42	124.41	124.39	124.42	124.22	124.50	124.90	124.62	124.50
15	124.42	124.32	124.30	124.40	124.40	125.10	124.38	124.45	124.42	124.82	124.60	124.62
16	124.42	124.32	124.38	124.36	124.39	124.98	124.38	124.60	124.42	124.75	124.58	124.78
17	124.46	124.42	124.42	124.38	124.35	124.60	124.36	124.55	124.78	125.35	124.68	124.75
18	124.48	124.23	124.45	124.40	124.90	124.50	124.36	124.30	125.06	125.00	125.05	124.65
19	124.38	124.25	124.50	124.38	127.02	124.45	124.38	124.30	124.95	124.85	124.75	124.68
20	124.40	124.32	124.50	124.20	125.52	124.48	124.40	124.28	124.80	124.68	124.60	124.50
21	124.34	124.35	124.70	124.35	125.00	124.45	124.36	124.28	125.02	124.72	124.72	124.45
22	124.36	124.32	124.70	124.35	124.80	124.50	124.35	124.25	124.98	124.75	125.48	124.52
23	124.30	124.30	124.55	124.38	124.72	125.52	124.44	124.28	124.85	124.62	125.50	124.50
24	124.28	124.25	124.48	124.35	124.58	124.98	126.32	124.32	124.70	124.64	125.00	124.52
25	124.25	124.25	124.52	124.29	124.55	125.45	124.95	124.35	124.62	124.62	124.95	124.45
26	124.28	124.30	125.35	124.39	124.58	125.35	124.72	124.38	124.58	124.50	125.08	124.42
27	124.30	124.30	126.12	124.45	124.50	124.78	124.55	124.40	124.62	124.52	124.82	124.62
28	124.28	124.32	125.10	124.48	124.48	124.65	124.52	124.42	126.12	124.58	124.80	124.48
29	124.32	124.28	124.70	124.40	124.60	124.48	124.50	......	125.05	124.60	124.75	124.45
30	124.25	124.35	124.65	124.42	124.62	124.40	124.46	......	124.98	124.60	124.68	124.45
31	124.28	124.28	......	125.70	......	*a*	124.45	......	124.85	......	124.60	......

a No record.

WOOD CREEK ABOVE LOCK No. 11, NEAR COMSTOCK

Gage No. 123

This station, established October 29, 1916, is located at lock No. 11, about ¾ mile north of Comstock. The gage, No. 123, is a standard Type A gage, having a range of 4 feet, between elevations 122.0 and 126.0, secured to the upper end of the upper gate recess of the east lock wall. A standard bench-mark plug is located near the gage at elevation 129.0 (B. C. datum).

The gage is read twice daily — at 6 A. M. and 6 P. M. or 8 A. M. and 4 P. M. — to hundredths.

Daily elevation of water-surface (B. C. datum) of WOOD CREEK ABOVE LOCK 11, NEAR COMSTOCK, for the year ended June 30, 1919. Chas. A. Hines, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	124.33	124.32	124.34	124.42	124.88	124.48	124.38	124.22	126.15	124.64	124.45	124.42
2	124.38	124.26	124.40	124.38	124.60	124.42	125.08	124.16	125.12	124.63	124.85	124.39
3	124.31	124.25	124.35	124.38	124.40	124.51	124.66	124.27	124.91	124.65	124.72	124.45
4	124.25	124.23	124.30	124.38	124.50	124.42	124.60	124.22	124.78	124.88	124.51	124.48
5	124.36	124.26	124.28	124.35	124.56	124.46	124.48	124.22	124.84	125.02	124.56	124.42
6	124.24	124.24	124.28	124.60	124.50	124.38	124.54	124.18	124.62	124.89	124.58	124.36
7	124.35	124.30	124.25	124.25	124.46	124.32	124.60	124.20	124.50	124.82	124.54	124.39
8	124.38	124.28	124.28	123.80	124.42	124.38	124.60	124.15	124.40	124.76	124.71	124.54
9	124.30	124.27	124.26	124.05	124.42	124.42	124.58	124.13	124.65	124.78	124.59	124.64
10	124.37	124.26	124.25	123.35	124.39	124.42	124.42	124.10	125.99	124.68	124.52	125.00
11	124.48	124.28	124.30	124.15	124.40	124.30	124.45	124.00	124.98	124.74	124.53	124.62
12	124.42	124.32	124.25	124.36	124.40	124.32	124.41	124.20	124.72	125.95	124.56	124.45
13	124.35	124.29	124.25	124.30	124.33	124.36	124.47	124.12	124.65	125.22	124.55	124.39
14	124.40	124.27	124.28	124.30	124.39	124.36	124.40	124.06	124.49	124.88	124.49	124.38
15	124.35	124.31	124.25	124.29	124.28	124.90	124.38	124.39	124.42	124.75	124.52	124.52
16	124.32	124.33	124.31	124.25	124.36	124.89	124.39	124.48	124.48	124.72	124.46	124.70
17	124.35	124.28	124.28	124.31	124.28	124.58	124.32	124.47	124.95	125.24	124.50	124.50
18	124.42	124.30	124.36	124.25	124.72	124.48	124.22	124.36	125.12	124.90	125.02	124.42
19	124.40	124.26	124.41	124.24	126.65	124.38	124.30	124.25	124.92	124.78	124.70	124.42
20	124.32	124.29	124.45	124.28	125.31	124.29	124.31	124.22	124.74	124.73	124.62	124.38
21	124.28	124.22	124.62	124.35	124.95	124.32	124.28	124.20	124.76	124.62	124.52	124.36
22	124.26	124.20	124.48	124.38	124.78	124.36	124.28	124.28	124.75	124.67	125.64	124.28
23	124.28	124.28	124.43	124.35	124.65	125.30	124.34	124.20	124.56	124.60	125.36	124.35
24	124.26	124.22	124.30	124.20	124.55	124.88	125.85	124.24	124.52	124.50	124.86	124.30
25	124.12	124.20	124.48	124.25	124.52	125.30	124.86	124.32	124.52	124.52	124.80	124.38
26	124.30	124.34	125.26	124.35	124.50	125.20	124.64	124.30	124.52	124.46	125.04	124.36
27	124.25	124.32	126.45	124.40	124.40	124.79	124.51	124.13	124.52	124.46	124.74	124.40
28	124.28	124.25	125.00	124.40	124.41	124.60	124.46	124.28	125.83	123.46	124.61	124.44
29	124.28	124.22	124.65	124.34	124.60	124.50	124.42	......	124.52	124.52	124.52	124.28
30	124.25	124.22	124.56	124.42	124.58	124.46	124.40	......	124.87	124.58	124.52	124.35
31	124.28	124.20	......	125.51	......	124.42	124.38	......	124.78	......	124.44	......

WOOD CREEK BELOW LOCK No. 11, NEAR COMSTOCK

Gage No. 124

This station, established October 29, 1916, is located at lock No. 11, about ¾ mile north of Comstock. The gage, No. 124, a standard Type A gage, having a range of 4 feet, between elevations 110.0 and 114.0, secured to the upper end of the lower gate recess of the east lock wall, was superseded on December 21, 1917, by a standard Type A gage, secured to the east side of the lower east approach wall. The gage has a range of 8 feet, between elevations 110.0 and 118.0. A standard bench-mark plug is set in the wall near the gage at elevation 116.0 (B. C. datum).

The gage is read twice daily — at 6 A. M. and 6 P. M. or 8 A. M. and 4 P. M.— to hundredths.

Daily elevation of water-surface (B. C. datum) of WOOD CREEK BELOW LOCK 11, NEAR COMSTOCK, for the year ended June 30, 1919. Chas. A. Hines, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	112.22	111.75	112.44	112.45	112.10	112.25	112.39	112.25	114.68	112.60	112.28	112.32
2.....	112.42	111.90	112.40	112.35	112.25	111.78	112.50	112.42	112.25	112.49	112.28	112.09
3.....	112.47	111.81	112.20	112.00	112.35	112.35	112.22	112.08	112.40	112.29	112.28	112.22
4.....	112.48	112.12	112.08	112.35	112.42	112.38	112.54	112.14	111.98	112.45	112.36	112.30
5.....	112.40	112.22	112.05	112.52	112.38	112.40	112.38	112.15	112.25	110.82	112.34	112.28
6.....	112.56	112.02	112.08	112.32	112.00	112.21	112.26	111.94	112.20	112.28	112.48	112.25
7.....	112.47	111.98	111.88	112.15	112.44	111.38	112.00	111.98	112.16	112.22	112.32	112.35
8.....	112.15	111.81	112.15	112.45	112.45	112.35	112.06	111.98	112.35	112.35	112.41	112.59
9.....	111.96	111.82	112.20	112.30	112.32	111.82	112.38	112.33	112.62	112.18	112.38	112.50
10.....	111.95	111.98	112.06	112.10	112.22	112.35	112.02	111.78	112.94	112.38	112.38	112.41
11.....	112.40	112.26	111.78	111.75	112.40	112.10	112.12	110.68	112.25	112.24	112.38	112.45
12.....	112.16	112.26	111.58	112.08	112.26	111.75	111.92	109.38	112.12	113.12	112.40	112.28
13.....	112.36	112.28	111.68	112.15	112.20	112.09	111.94	109.18	112.48	112.16	112.32	112.27
14.....	112.48	112.32	111.88	112.02	112.22	112.30	111.88	109.20	112.20	112.32	112.33	112.32
15.....	112.28	112.28	112.40	111.99	112.04	112.44	111.94	110.80	112.35	112.08	112.42	112.30
16.....	112.45	111.96	112.32	112.15	112.24	112.34	112.02	112.10	112.02	112.25	112.22	112.30
17.....	112.48	111.75	112.15	111.75	112.20	112.30	112.18	111.95	111.98	112.12	112.34	112.30
18.....	112.38	112.10	111.94	111.80	112.48	112.28	112.05	111.93	112.32	112.26	112.42	112.32
19.....	112.22	112.09	112.45	112.05	113.50	112.30	112.29	111.52	112.18	112.35	112.28	112.18
20.....	112.55	111.68	112.40	112.28	112.38	112.27	111.92	110.94	112.15	112.21	112.40	112.25
21.....	112.51	111.48	112.32	112.05	111.85	112.42	111.78	110.28	112.25	112.28	112.48	112.38
22.....	112.22	111.45	112.45	111.98	112.20	112.48	111.68	110.95	112.55	112.28	112.78	112.35
23.....	112.15	111.78	112.39	111.92	112.40	112.52	111.78	112.30	112.35	112.29	112.62	112.17
24.....	111.81	111.90	112.35	112.15	112.19	112.48	114.14	112.07	112.28	112.11	112.28	112.22
25.....	111.72	112.09	112.37	112.30	111.80	112.46	112.47	112.27	112.30	112.08	112.48	112.26
26.....	111.80	112.20	112.76	112.20	112.38	112.42	112.47	112.28	112.22	112.10	112.48	112.28
27.....	111.98	112.02	112.54	112.30	112.40	112.28	112.05	112.31	112.28	112.16	112.38	112.25
28.....	112.45	111.92	112.08	112.20	112.42	112.32	112.35	112.22	113.04	112.08	112.38	112.40
29.....	112.42	112.02	111.95	112.10	112.30	112.20	112.28	......	112.24	112.26	112.21	111.90
30.....	112.22	111.90	112.35	112.85	112.32	112.42	112.36	......	112.28	112.28	112.42	112.15
31.....	112.00	111.88	......	112.75	......	112.14	112.02	......	112.48	......	112.38	......

WOOD CREEK ABOVE LOCK No. 12, AT WHITEHALL

Gage No. 125

This station, established October 1, 1916, is located at the upper end of lock No. 12. The gage, No. 125, is a standard Type A gage, secured to the upper end of the east upper gate recess and has a range of 4 feet, between elevations 110.0 and 114.0. A standard bench-mark plug is set in the wall above the gage at elevation 118.0 (B. C. datum).

The gage is read twice daily — at 6 A. M. and 5 or 6 P. M. — to tenths, with occasional readings to half-tenths.

Daily elevation of water-surface (B. C. datum) of WOOD CREEK ABOVE LOCK No. 12, AT WHITEHALL, for the year ended June 30, 1919. W. J. Berry and H. Pfandler, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	112.00	111.35	112.25	112.22	111.75	111.90	112.15	112.05	113.50	112.10	112.18	112.20
2	112.25	111.55	112.28	112.20	112.00	111.60	112.10	112.20	111.90	112.10	112.10	111.98
3	112.20	111.62	111.98	111.80	111.98	112.10	112.00	112.00	112.08	112.00	112.00	112.00
4	112.18	112.00	111.98	112.30	112.15	112.15	112.20	111.90	111.85	112.20	112.08	112.12
5	112.15	112.05	111.90	112.35	112.05	112.05	112.10	112:00	112.18	111.08	112.10	112.10
6	112.30	111.85	111.82	112.15	111.82	111.70	112.15	111.88	112.05	111.88	112.15	112.15
7	112.20	111.80	111.68	111.90	112.20	111.60	112.00	111.85	111.95	112.10	112.18	112.25
8	112.15	111.75	112.02	112.20	112.10	112.20	112.30	111.75	112.22	112.05	112.25	112.40
9	111.82	111.60	112.00	112.12	112.15	112.10	112.30	112.20	112.30	112.00	112.12	112.32
10	111.75	111.85	111.80	111.85	112.05	112.05	112.10	111.70	111.80	112.20	112.20	112.25
11	112.22	112.15	111.58	111.50	112.15	111.65	112.10	110.90	111.35	112.10	112.10	112.20
12	112.00	112.05	111.42	111.98	111.90	111.70	112.10	109.62	111.95	112.00	112.15	112.12
13	112.30	112.22	111.45	112.08	111.95	111.75	112.00	108.85	112.05	112.15	112.15	112.15
14	112.32	112.12	111.68	111.75	112.05	111.95	112.10	108.80	111.90	111.85	112.15	112.12
15	112.12	111.88	112.02	111.80	111.85	111.95	112.10	109.90	112.15	112.00	112.15	112.10
16	112.25	111.65	112.10	111.92	112.10	112.00	112.00	111.85	111.85	112.05	112.15	112.10
17	112.20	111.45	111.95	111.55	112.05	112.15	112.20	111.80	111.80	111.85	112.20	112.12
18	112.18	111.90	111.78	111.45	112.25	112.00	112.00	111.60	112.00	112.00	112.12	112.15
19	112.15	111.85	112.25	111.78	111.65	112.05	112.20	111.30	111.80	112.05	112.12	112.15
20	112.32	111.50	112.25	112.20	111.48	112.00	112.20	110.30	111.95	112.05	112.20	112.05
21	112.30	111.30	112.20	111.85	111.55	112.05	111.48	109.85	112.00	112.22	112.25	112.18
22	112.02	111.42	112.18	111.85	112.00	112.10	111.35	110.65	112.15	112.05	111.35	112.10
23	111.78	111.62	112.20	111.80	112.15	111.90	111.45	112.05	111.95	112.12	111.55	111.95
24	111.68	111.70	112.18	111.92	112.05	112.22	111.65	111.70	112.00	111.98	112.12	112.02
25	111.45	111.95	112.28	112.10	111.65	111.95	111.90	112.10	112.08	111.88	112.15	112.10
26	111.50	112.08	112.05	112.15	112.15	112.00	112.02	112.00	112.05	111.82	112.20	112.15
27	111.80	111.90	111.32	112.05	112.05	112.00	111.95	112.00	112.08	111.85	112.20	112.12
28	112.22	111.70	111.80	112.00	112.18	112.10	111.93	111.80	112.10	111.90	112.18	112.15
29	112.28	111.82	111.80	112.00	112.05	112.00	112.10	......	112.00	111.80	119.08	111.88
30	112.02	111.75	112.15	112.15	112.12	112.00	112.05	......	112.00	111.90	112.20	112.00
31	111.62	111.62	......	111.72	......	112.10	111.82	......	112.05	......	112.20	......

LAKE GEORGE

For the purpose of determining the rate of change and the range in elevation of the water-surface of the lake, gages were established on Lake George in July, 1913, at three points — Lake George, Sagamore (Bolton Landing) and Rogers Rock — by the United States Geological Survey in coöperation with the New York State Conservation Commission.

The gages were not set to any particular datum, but each was referred to a substantial bench-mark by the use of an engineer's level. The gages were read once each day to the nearest half-tenth and the force and direction of the wind recorded.

A comparative study of these gage heights and those obtained at the mill of the International Paper Company indicates that the zeros of all three gages are below the crest of the dam as follows:

Lake George	4.75 feet below crest
Sagamore	4.9 feet below crest
Rogers Rock	3.4 feet below crest

All three gages were read until June 30, 1914. Comparison of the records up to this date showed that one gage would indicate the mean elevation of the lake and the observations at Lake George and Sagamore were discontinued July 1, 1914.

LAKE GEORGE AT ROGERS ROCK

Location.— At a boat-house in a small bay on the north side of the steamboat landing at Rogers Rock, Essex county.

Drainage area.— Not measured.

Records available.— July 10, 1913, to June 30, 1919.

Gage.— Vertical staff fastened to a pile in the back end of the boat-house. Datum, 3.15 * feet below crest of dam at outlet of lake. Gage read once daily by George O. Cook.

Extremes of stage.— Current year: Maximum stage recorded, 4.68 feet, May 24. Minimum stage recorded, 2.2 feet, October 27 and 29.

* Determined by levels; supersedes the estimated datum previously published.

1913–1919: Maximum stage recorded, 4.98 feet, May 2, 1914. Minimum stage recorded, 1.2 feet on November 21 and December 22, 1916.

Regulation.— The elevation of lake surface is regulated by the operation of gates and wheels at the dam at the outlet of the lake at Ticonderoga.

Coöperation.— Station established by the United States Geological Survey in coöperation with the State Conservation Commission. Gage heights for current year furnished by International Paper Company.

Daily gage height, in feet, of LAKE GEORGE AT ROGERS ROCK, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	3.65	3.18	2.58	2.42	2.50	2.90	3.00	3.00	2.82	3.80	4.42	4.45
2.....	3.5	3.1	2.62	2.4	2.45	2.85	3.1	3.02	2.88	3.78	4.5	4.4
3.....	3.52	3.0	2.6	2.38	2.48	2.82	3.22	3.0	2.88	3.82	4.42	4.48
4.....	3.48	3.1	2.52	2.4	2.45	2.8	3.18	2.98	2.85	3.8	4.48	4.35
5.....	3.5	3.05	2.5	2.4	2.42	2.82	3.12	2.95	2.82	3.88	4.45	4.32
6.....	3.5	2.98	2.55	2.35	2.48	2.8	3.1	2.9	2.85	3.92	4.42	4.35
7.....	3.55	3.0	2.5	2.3	2.5	2.8	3.18	2.9	2.88	3.98	4.45	4.3
8.....	3.55	2.95	2.55	2.42	2.4	2.82	3.15	2.88	2.85	4.0	4.4	4.32
9.....	3.52	2.9	2.4	2.42	2.48	2.8	3.12	2.85	2.92	4.02	4.35	4.35
10.....	3.5	2.92	2.38	2.4	2.5	2.78	3.15	2.85	3.12	4.1	4.35	4.3
11.....	3.5	3.0	2.4	2.38	2.45	2.75	3.15	2.82	3.15	4.2	4.32	4.25
12.....	3.48	2.95	2.45	2.4	2.48	2.72	3.0	2.85	3.12	4.4	4.35	4.2
13.....	3.45	2.98	2.48	2.38	2.42	2.7	3.05	2.82	3.0	4.45	4.4	4.18
14.....	3.42	2.98	2.45	2.35	2.38	2.7	3.02	2.8	3.05	4.5	4.4	4.15
15.....	3.45	2.95	2.42	2.3	2.4	2.78	3.05	2.82	3.12	4.48	4.38	4.15
16.....	3.45	2.88	2.4	2.28	2.38	2.75	3.08	2.85	3.2	4.5	4.4	4.18
17.....	3.4	2.85	2.38	2.25	2.4	2.7	3.05	2.82	3.15	4.58	4.45	4.1
18.....	3.38	2.8	2.35	2.22	2.42	2.72	3.02	2.8	3.25	4.55	4.48	4.12
19.....	3.4	2.75	2.4	2.25	2.7	2.78	2.98	2.8	3.2	4.55	4.5	4.1
20.....	3.4	2.8	2.35	2.32	2.75	2.8	3.05	2.78	3.28	4.6	4.45	4.08
21.....	3.38	2.7	2.35	2.3	2.8	2.8	3.0	2.75	3.35	4.5	4.4	4.1
22.....	3.4	2.75	2.4	2.25	2.85	2.82	3.02	2.78	3.3	4.58	4.55	3.85
23.....	3.35	2.75	2.35	2.28	2.88	2.85	3.05	2.8	3.35	4.58	4.65	3.95
24.....	3.32	2.72	2.32	2.22	2.9	2.78	3.1	2.82	3.38	4.62	4.68	3.85
25.....	3.28	2.7	2.4	2.25	2.82	2.98	3.08	2.85	3.4	4.58	4.65	3.88
26.....	3.3	2.68	2.35	2.28	2.8	2.95	3.05	2.8	3.42	4.6	4.65	3.85
27.....	3.3	2.65	2.5	2.2	2.82	3.0	3.08	2.8	3.45	4.58	4.62	3.8
28.....	3.2	2.62	2.5	2.22	2.8	2.8	3.05	2.78	3.7	4.55	4.55	3.78
29.....	3.25	2.6	2.48	2.2	2.85	2.85	3.05	......	3.75	4.52	4.6	3.82
30.....	3.3	2.58	2.45	2.22	2.9	2.9	3.08	......	3.8	4.45	4.5	3.85
31.....	3.12	2.55	......	2.42	......	3.02	3.05	......	3.85	......	4.48	......

AUSABLE RIVER

DESCRIPTION

Ausable river is formed by the junction of the east and west branches, which have their headwaters in the northwestern part of Essex county. The east branch flows from upper Ausable lake, at an elevation of 1,990 feet above sea-level. The west branch, formed by several small streams that lie in the valley to the west and north of the east branch, receives the outflow from Lake Placid at elevation 1,864 feet. Both branches flow north and east to their junction at the village of Ausable Forks, about 20 miles from the mouth of the stream along the river, from which point the river flows northeast, entering Lake Champlain about 10 miles south of Plattsburg and opposite and slightly north of the city of Burlington, Vt. In this 20 miles a total descent of 460 feet occurs, a portion of which is in the famous Ausable chasm.

The drainage basin of Ausable river occupies a plateau at a general elevation of 800 to 1,200 feet, the mountainous boundaries of the watershed rising to altitudes of 3,000 to 5,000 feet. Throughout the entire course, the river is fed by small mountain streams that enter at nearly right angles from the mountains on either side. There are few lakes in this drainage area to act as regulators of the flow, and, owing to the great differences of elevation throughout the area, the stream has what is called a flashy discharge, its fluctuations being large and rapid.

Owing to the fact that this basin lies on the eastern slope of the Adirondack mountains, the average rainfall is less than for those basins whose streams rise on the western and southern slopes, the mean yearly precipitation being about 32 inches.

Drainage areas of AUSABLE RIVER*

LOCATION	AREA	
	Place to place	Total
	Square miles	*Square miles*
Lake Placid, water-surface	....	3.80
Lake Placid, drainage area	21.80	21.80
West branch from foot of Lake Placid to junction with east branch	211.20	233.00
East branch above forks	196.90	429.90
Above gaging station	40.10	470.00
Gaging station to Keeseville	6.10	476.10
Keeseville to Birmingham	27.40	503.50
Birmingham to mouth	17.80	521.30

* From Willsboro, Ausable, Lake Placid, Mount Marcy and Elizabethtown sheets of the United States Geological Survey topographic maps.

AUSABLE RIVER AT AUSABLE FORKS

Location.— In the village of Ausable Forks, Clinton county, immediately below the junction of the east and west branches and about 15 miles above the mouth of the river.

Drainage area.— 444 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— August 17, 1910, to June 30, 1919.

Gage.— Chain on left bank about 1,000 feet below junction of east and west branches; read by A. S. Baker.

Discharge measurements.— Made from a cable about 1½ miles below gage, or by wading either near the cable or a short distance above the gage.

Channel and control.— Stone and gravel, occasionally shifting. Channel divided by an island opposite the gage.

Extremes of discharge.— Current year: Maximum stage recorded, 9.0 feet at 8 A. M., October 6; discharge, 15,600 second-feet. Minimum stage recorded, 3.36 feet at 5 P. M., July 27; discharge, 94 second-feet.

1910–1919: Maximum stage recorded, 10.2 feet in the evening of March 27, 1913; discharge, about 25,000 second-feet. Minimum stage recorded, 3.0 feet at 7 A. M., July 21, 1912; discharge, practically zero.

Special study.— A portable water-stage recorder was installed at this station and a continuous gage height record obtained, July 11 to September 30, 1914, which showed a continual small fluctuation in stage. It was shown that monthly mean discharge based on semidaily gage heights is in error as follows: July 11 to 31, 3.5 per cent; August, 4.1 per cent; September, 0.5 per cent. Some of the daily discharges showed greater errors, but these were largely compensating.

Ice.— Stage-discharge relation slightly affected by ice.

Accuracy.— Stage-discharge relation probably permanent between dates of shifting. Affected by ice for short periods from December to March. Rating curve fairly well defined between 175 and 3,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurement of AUSABLE RIVER AT AUSABLE FORKS, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
Jan. 10 *a*	M. H. Carson	4.10	327

a Backwater present, due to ice.

Daily gage height, in feet, AUSABLE RIVER AT AUSABLE FORKS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	3.75	3.63	4.48	4.26	5.0	4.01	4.22	3.92	4.38	4.32	4.23	*a*
2	4.33	3.55	3.98	4.00	4.7	3.96	4.48	4.5	4.05	4.18	4.45	*a*
3	3.85	3.51	3.85	4.18	4.6	4.18	4.25	3.98	3.88	4.30	4.6	*a*
4	3.74	3.50	3.59	4.40	4.42	4.40	4.08	3.91	3.92	4.32	4.7	*a*
5	3.69	3.46	3.60	4.20	4.28	3.98	3.92	3.78	3.96	4.16	5.9	3.72
6	3.70	3.42	4.02	8.7	4.19	3.96	4.18	3.67	4.10	4.50	5.2	3.72
7	3.82	3.42	4.08	6.3	4.12	3.94	4.24	3.69	4.20	5.3	4.9	4.28
8	3.90	3.46	3.84	5.05	4.01	3.93	4.35	3.68	3.98	5.35	4.7	4.38
9	3.94	6.2	3.77	*a*	4.7	4.16	*a*	3.69	3.88	4.95	4.5	4.04
10	3.94	5.15	3.69	*a*	4.40	4.65	4.6	3.67	4.00	4.85	4.35	3.98
11	3.92	4.9	3.61	*a*	4.5	3.99	4.26	3.66	3.99	5.7	4.38	3.88
12	3.95	4.85	3.52	*a*	4.35	3.98	4.5	3.65	3.96	7.0	4.5	3.76
13	3.93	4.7	3.51	4.32	4.30	3.88	4.08	3.64	3.98	5.25	4.5	3.72
14	4.04	3.98	4.28	4.18	4.00	4.27	4.6	3.65	3.94	4.95	4.46	3.74
15	3.95	3.88	3.85	4.26	3.98	4.8	4.06	3.66	4.18	4.65	4.42	*a*
16	3.82	3.70	3.76	4.10	3.94	4.5	3.96	3.64	3.96	4.55	4.35	4.6
17	3.74	3.64	4.08	3.98	3.94	4.43	3.94	3.66	4.10	4.6	4.5	4.14
18	3.72	3.60	4.45	4.28	4.35	4.23	3.92	3.69	5.6	4.8	5.3	4.39
19	3.70	3.54	4.5	4.18	5.5	3.98	3.79	3.71	4.9	5.6	4.75	3.78
20	3.63	3.50	4.10	4.28	5.1	4.30	3.75	3.74	4.55	4.6	4.6	4.02
21	3.58	3.55	4.40	4.44	4.7	4.20	3.74	3.82	4.8	4.55	4.38	3.92
22	3.58	3.52	4.47	4.36	4.45	4.35	3.75	3.78	4.7	4.47	5.7	3.82
23	3.54	3.52	4.38	4.22	4.32	4.8	3.78	3.70	4.42	4.43	5.9	3.90
24	3.50	3.52	4.36	4.15	4.22	4.7	4.30	3.69	4.28	4.55	5.15	3.83
25	3.48	3.50	4.45	4.00	4.18	4.6	3.98	3.71	4.26	4.5	4.75	3.48
26	3.48	3.53	4.55	4.13	4.22	*a*	3.91	3.76	4.34	4.33	4.7	3.55
27	3.38	3.52	5.1	4.33	4.17	4.10	3.82	3.76	4.42	4.22	4.5	3.72
28	3.44	3.50	4.65	4.22	4.15	4.15	3.78	3.78	7.6	4.24	4.32	4.22
29	3.40	3.54	4.32	4.22	4.13	4.5	3.80	......	5.5	4.33	4.12	4.08
30	3.61	3.53	4.19	5.0	4.18	4.55	3.78	......	4.65	4.28	3.92	3.88
31	3.85	3.53	......	5.6	......	4.55	3.82	......	4.48	......	3.83	......

a No record.

Daily discharge, in second-feet, of AUSABLE RIVER AT AUSABLE FORKS, during the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	345	250	1,230	903	2,270	599	851	340	1,070	984	864	380
2	998	196	567	588	1,620	546	1,230	320	645	800	1,180	360
3	436	170	436	800	1,440	800	890	320	465	955	1,440	340
4	336	164	221	1,100	1,130	1,100	679	300	505	984	1,620	320
5	294	142	227	825	929	567	505	300	546	776	4,480	319
6	302	121	611	14,300	813	546	460	280	702	1,260	2,720	319
7	407	121	679	5,600	727	526	400	294	825	2,950	2,050	929
8	484	142	426	2,380	599	515	380	287	567	3,070	1,620	1,070
9	526	5,310	362	1,440	1,620	776	340	294	465	2,160	1,260	634
10	526	2,600	294	929	1,100	1,530	320	280	588	1,940	1,030	567
11	505	2,050	234	727	1,260	578	320	272	578	3,950	1,070	465
12	536	1,940	177	727	1,030	567	300	264	546	7,740	1,260	354
13	515	1,620	170	984	955	465	340	257	567	2,840	1,260	319
14	634	567	929	800	588	916	700	264	526	2,160	1,200	336
15	536	465	436	903	567	1,830	550	272	800	1,530	1,130	1,200
16	407	302	354	714	526	1,260	440	257	546	1,350	1,030	1,440
17	336	257	679	567	526	1,150	400	272	702	1,440	1,260	751
18	319	227	1,180	929	1,030	864	380	294	3,690	1,830	2,950	1,090
19	302	189	1,260	800	3,440	567	360	311	2,050	3,690	1,730	371
20	250	164	702	929	2,490	955	345	336	1,350	1,440	1,440	611
21	214	196	1,100	1,160	1,620	825	336	407	1,830	1,350	1,070	505
22	214	177	1,210	1,040	1,180	1,030	345	371	1,620	1,210	3,950	407
23	189	177	1,070	851	984	1,830	371	302	1,130	1,150	4,480	484
24	164	177	1,040	764	851	1,620	955	294	929	1,350	2,600	417
25	153	164	1,180	588	800	1,440	567	311	903	1,260	1,730	153
26	153	183	1,350	739	851	955	494	354	1,010	998	1,620	196
27	102	177	2,490	998	788	702	407	354	1,130	851	1,260	319
28	132	164	1,530	851	764	764	371	371	9,790	877	984	851
29	110	189	984	851	739	1,260	388	......	3,440	998	727	679
30	234	183	813	2,270	800	1,350	371	......	1,530	929	505	465
31	436	183	......	3,690	......	1,350	360	......	1,230	......	417	......
Mean	358	612	798	1,640	1,130	961	489	306	1,360	1,830	1,680	555

NOTE.— Stage-discharge relation affected by ice, January 6 to 19 and January 31 to February 5. Daily discharge for these periods is approximate. Daily discharge estimated, June 1 to 4 and 15 to 18, by comparing with hydrograph of Saranac river near Plattsburg.

Monthly discharge of AUSABLE RIVER AT AUSABLE FORKS, for the year ended June 30, 1919

[Drainage area, 444 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	998	102	358	0.806	0.93
August	5,310	121	612	1.38	1.59
September	2,490	170	798	1.80	2.01
October	14,300	567	1,640	3.69	4.25
November	3,440	526	1,130	2.55	2.84
December	1,830	465	961	2.16	2.49
January	1,230	300	489	1.10	1.27
February	407	257	306	0.689	0.72
March	9,790	465	1,360	3.06	3.53
April	7,740	776	1,830	4.12	4.61
May	4,480	417	1,680	3.78	4.36
June	1,440	153	555	1.25	1.40
The year	14,300	102	977	2.20	29.99

WEST BRANCH OF AUSABLE RIVER NEAR NEWMAN

Location.— On farm of James Dudley, about 4 miles northeast of Newman, Essex county, and 4 miles below confluence at Lake Placid.

Drainage area.— 116 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— June 7, 1916, to December 31, 1916, May 1, 1917, to June 30, 1917, and October 1, 1917, to December 31, 1917.

Gage.— Staff, in two sections, on the right bank near the residence of Mr. Dudley. Lower section is inclined, graduated from 1.0 foot to 6.5 feet; the upper section is vertical, graduated from 6.55 feet to 10.1 feet; read by Jesse Martin.

Discharge measurements.— Made by wading or from cable 300 feet above gage.

Channel and control.— Solid rock.

Extremes of discharge.— 1916–1918: Maximum daily discharge recorded, 615 second-feet on June 12, 1917. Minimum daily discharge recorded, 32 second–feet on August 30, and September 13, 1916.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Daily discharge, in second-feet, of WEST BRANCH AUSABLE RIVER NEAR NEWMAN, for the year ended June 30, 1916

DAY	June	DAY	June	DAY	June
1		11	136	21	174
2		12	190	22	159
3		13	174	23	144
4		14	174	24	129
5		15	159	25	122
6		16	159	26	129
7	166	17	240	27	114
8	144	18	240	28	206
9	144	19	198	29	144
10	144	20	190	30	159

Daily discharge, in second-feet, of WEST BRANCH AUSABLE RIVER NEAR NEWMAN, for the year ended June 30, 1917

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	114	74	47	129	78	223	......	......	......	......	267	332
2	114	71	71	92	99	159	......	......	......	......	276	370
3	129	71	57	88	111	190	......	......	......	......	249	450
4	223	57	57	74	92	174	......	......	......	......	258	313
5	294	64	50	85	88	152	......	......	......	......	206	258
6	240	47	47	47	88	267	......	......	......	......	198	276
7	159	50	47	74	74	198	......	......	......	......	198	232
8	136	68	47	68	71	190	......	......	......	......	174	313
9	122	114	57	68	122	182	......	......	......	......	166	351
10	129	106	47	68	166	249	......	......	......	......	206	240
11	190	71	44	64	129	198	......	......	......	......	190	390
12	190	74	47	44	96	174	......	......	......	......	258	615
13	159	54	32	71	85	122	......	......	......	......	249	370
14	240	64	44	144	78	174	......	......	......	......	240	294
15	159	57	129	88	96	174	......	......	......	......	294	450
16	122	60	159	71	85	144	......	......	......	......	223	249
17	223	34	85	92	92	88	......	......	......	......	198	240
18	223	38	85	88	74	92	......	......	......	......	267	240
19	159	44	71	88	85	85	......	......	......	......	214	93
20	129	38	57	223	74	78	......	......	......	......	370	249
21	106	42	71	294	47	64	......	......	......	......	351	294
22	99	34	60	182	44	64	......	......	......	......	249	313
23	206	38	129	136	64	96	......	......	......	......	332	276
24	240	50	144	102	470	106	......	......	......	......	313	258
25	198	57	99	64	223	78	......	......	......	......	267	240
26	159	57	82	99	174	102	......	......	......	......	258	249
27	166	34	92	92	136	106	......	......	......	......	240	240
28	136	42	47	78	114	111	......	......	......	......	294	223
29	111	38	78	64	111	111	......	......	......	......	313	206
30	96	32	214	60	240	92	......	......	......	......	370	410
31	96	38	......	57	......	92	......	......	......	......	390	......
Mean	163	55.4	76.5	96.4	117	140	......	......	......	......	261	301

Daily discharge, in second-feet, of WEST BRANCH OF AUSABLE RIVER NEAR NEWMAN, for the year ended June 30, 1918

DAY	Oct.	Nov.	Dec.	DAY	Oct.	Nov.	Dec.
1	129	294	61	16	223	63	68
2	136	232	65	17	152	86	79
3	122	190	58	18	129	68	72
4	159	182	65	19	129	86	91
5	206	166	63	20	276	114	91
6	206	108	65	21	206	86	93
7	159	129	54	22	182	82	93
8	122	144	42	23	136	93	68
9	129	114	58	24	129	91	52
10	108	114	52	25	182	86	39
11	105	105	52	26	174	86	58
12	86	96	82	27	198	58	63
13	276	72	42	28	370	58	65
14	159	52	49	29	276	79	86
15	166	86	82	30	595	63	45
				31	490	......	45
				Mean	197	109	64.5

Monthly discharge of WEST BRANCH AUSABLE RIVER NEAR NEWMAN, for the period ended June 30, 1918

[Drainage area, 116 square miles]

Month	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
1916					
July	294	96	163	1.41	1.63
August	114	32	55.4	0.478	0.55
September	214	32	76.5	0.659	0.76
October	294	44	96.4	0.831	0.96
November	470	44	117	1.01	1.13
December	267	64	140	1.21	1.40
1917					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	390	166	261	2.25	2.59
June	615	93	301	2.60	2.90
July	....	....	....	....	....
August	....	....	....	....	....
September	....	....	....	....	....
October	595	86	197	1.70	1.96
November	294	52	109	0.940	1.05
December	93	39	64.5	0.556	0.64

SARANAC RIVER

DESCRIPTION

Saranac river rises in southeastern Franklin county and flows northeastward to a point near Cadyville and thence eastward into Lake Champlain at Plattsburg. The southern boundary of the basin is the Ampersand mountain range and the stream drains the north slope of the most elevated region of the state of New York. About 16.2 per cent of the upper drainage area is water-surface. The areas tributary to the river are shown in the following table:

Drainage areas of SARANAC RIVER *

LOCATION	Area	Total area
	Square miles	*Square miles*
Above Saranac lake State dam	....	157.50
Above Saranac Lake village	44.90	202.40
Above Franklin Falls	104.30	306.70
North branch, Saranac river	136.60	136.60
At junction, North branch	....	498.80
Above High Falls	19.60	518.40
Above Cadyville	74.60	593.00
Above Kent Falls	2.90	595.90
Above Morrisonville	2.00	597.90
Above Lozier dam	26.10	a 624.00
Above mouth	5.60	629.60

* From Bien's Atlas of New York. a The U. S. Geological Survey gives the total area above the Lozier dam, measured on the U. S. G. S. topographic maps, as 607 square miles.

The results of gagings of Saranac river at a station formerly maintained at Saranac lake are given in the Report of the State Engineer and Surveyor for 1903, supplement, pages 71–4.

In 1854 a timber dam was built below lower Saranac lake for the purpose of flooding logs. In 1899–1901 a masonry dam and lock were erected by the State at this point.

SARANAC RIVER NEAR PLATTSBURG

Location.— At the Indian rapids power-plant (formerly known as Lozier dam) of the Plattsburg Gas and Electric Company, about 6 miles above the mouth of the river at Plattsburg, Clinton county.

Drainage area.— 607 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— March 27, 1903, to June 30, 1919.

Gages.— Crest gage, a vertical staff on the angle of the wing wall at the end of the racks. Datum raised 0.76 foot, August 20, 1906.

Tail-race gage, a vertical staff spiked to timber-work dike between tail-race and river and about 50 feet below power-house. Records of kilowatt output are obtained by a wattmeter on switchboard at half-hour intervals.

An inclined staff gage at the cable station, about 1/4 mile below the dam.

Discharge measurements.— Made from a cable at head of Indian rapids, 1/4 mile below the dam. Low-water measurements made by wading under cable or in tail-race. Gages and wattmeters read by power-house operators.

Discharge rating.— Records include flow over concrete spillway 171.25 feet in crest length, a rating for which has been prepared by use of coefficients* derived from experiments made in the hydraulic laboratory of Cornell University on a model section of the dam; the discharge through two power units equipped with 300-kilowatt generators, which have been rated by current-meter measurements; and the discharge through two 5-foot waste-gates when open.

Occasional observations are made on the inclined staff gage at the cable as a check on the ratings of spillway and turbines.

Extremes of discharge.— Current year: Maximum daily discharge, 3,400 second-feet, April 12 and 13. Minimum daily discharge, 200 second-feet, August 4.

1908–1919: Maximum daily discharge recorded, 6,410 second-feet, April 20, 1914. Minimum daily discharge recorded, 90 second-feet, September 28, 1914.

Special study.— A portable water-stage recorder was operated at the cable for a short period in July, 1914. Mean daily discharge computed from its record compared very closely with mean daily discharge based on power-plant.

Ice.— The crest of the spillway is kept free from ice, so that the stage-discharge relation is not affected.

Regulation.— The lakes and ponds on the main stream and tributaries above the station comprise a water-surface area of

* Horton, R. E., Weir experiments, coefficients and formulas, U. S. Geological Survey, Water-Supply Paper 200, pages 98–100, 1907.

about 25.5 square miles. The actual storage afforded by these reservoirs has been largely increased by the State dam at Lower Saranac lake, the operation of which affects the distribution of flow throughout the year.

Accuracy.— Discharge over the spillway ascertained by applying to the rating table mean gage heights for 6-hour periods. Discharge through the turbines ascertained by applying to their ratings the mean kilowatt output and head for 12-hour periods. Results fairly good.

Coöperation.— Station maintained by the United States Geological Survey in coöperation with the State Conservation Commission. Gage height records and wattmeter readings furnished by Plattsburg Gas and Electric Company, Herbert A. Stutchbury, Superintendent.

Daily discharge, in second-feet, of SARANAC RIVER NEAR PLATTSBURG, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	700	350	420	1,060	2,300	1,220	920	660	1,160	1,550	1,350	1.180
2.....	700	290	470	920	2,100	920	1,040	580	860	1,300	1,350	1,200
3.....	620	300	390	840	2,000	1,220	1,120	540	800	1,400	1,350	1,000
4.....	580	200	370	760	1,950	1,220	1,120	560	800	1,300	1,500	1,020
5.....	700	250	360	720	1,850	1,160	920	600	1,050	1,300	2,250	1,000
6.....	620	310	390	3,000	1,600	920	760	600	960	1,550	2,500	860
7.....	900	290	620	3,100	1,150	820	720	620	920	2,500	2,150	940
8.....	740	220	600	3,000	1,350	840	920	620	960	3,000	2,200	920
9.....	540	520	600	2,600	1,400	1,040	960	520	1,020	2,600	1,950	820
10.....	840	780	580	2,350	1,450	1,000	760	580	1,040	2,350	1,700	700
11.....	780	900	580	2,050	1,350	980	800	540	1,100	2,350	1,550	680
12.....	720	1,180	560	1,750	1,160	1,000	780	540	1,000	3,400	1,700	700
13.....	740	1,220	620	1,550	1,020	1,040	980	540	1,060	3,400	1,500	620
14.....	440	1,180	700	1,450	1,040	1,120	660	440	880	2,900	1,300	600
15.....	700	940	600	1,250	960	1,700	940	560	860	2,500	1,220	780
16.....	580	720	600	1,180	1,020	1,700	740	540	960	2,300	1,240	780
17.....	400	620	560	1,000	1,020	1,350	940	560	940	2,700	1,240	1,020
18.....	480	520	640	1,160	1,160	1,300	840	540	1,650	2,450	1,900	940
19.....	580	600	900	1,300	2,400	1,100	680	460	2,350	2,250	1,650	840
20.....	580	390	900	1,100	2,050	1,080	720	500	2,100	2,200	1,400	780
21.....	460	480	1,080	1,300	1,950	1,100	720	520	2,400	1,950	1,450	740
22.....	540	500	1,220	1,200	1,900	980	680	600	2,500	1,750	1,550	540
23.....	580	490	1,040	1,160	1,850	1,300	840	560	2,300	1,600	2,600	720
24.....	520	490	1,020	1,160	1,700	1,550	800	700	2,100	1,500	2,200	700
25.....	1,140	430	1,200	1,300	1,600	1,160	900	540	2,000	1,450	2,050	660
26.....	840	420	1,300	1,350	1,450	1,550	800	620	1,850	1,400	1,600	520
27.....	600	370	1,600	1,550	1,220	720	880	600	1,900	1,500	1,600	580
28.....	370	360	1,600	1,250	1,350	1,120	780	580	2,100	1,300	1,400	560
29.....	400	420	1,250	1,200	1,400	1,100	780	......	1,140	1,400	1,300	440
30.....	310	400	1,180	1,650	1,400	1,060	700	......	1,900	1,450	1,240	580
31.....	310	380	......	2,450	......	860	700	......	1,700	......	1,160	......
Mean...	613	533	798	1,540	1,540	1,140	835	565	1,430	2,020	1,650	781

Monthly discharge of SARANAC RIVER NEAR PLATTSBURG, for the year ended June 30, 1919

[Drainage area, 607 square miles]

Month	Discharge in Second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	1,140	310	613	1.01	1.16
August	1,220	200	533	0.878	1.01
September	1,600	360	798	1.31	1.46
October	3,100	720	1,540	2.54	2.93
November	2,400	960	1,540	2.54	2.83
December	1,700	720	1,140	1.88	2.17
January	1,120	660	835	1.38	1.59
February	700	440	565	0.931	0.97
March	2,500	800	1,430	2.36	2.72
April	3,400	1,300	2,020	3.33	3.72
May	2,600	1,160	1,650	2.72	3.14
June	1,200	440	781	1.29	1.44
The year	3,400	200	1,120	1.85	25.14

LAKE ONTARIO BASIN—MISCELLANEOUS MEASUREMENTS

Miscellaneous measurements in LAKE ONTARIO DRAINAGE BASIN, for the year ended June 30, 1919

Date	Stream	Locality	Gage height	Discharge
1918			*Feet*	*Sec.-ft.*
July 12	Genesee river	Rochester	1.14	764
July 20	Genesee river	Rochester	1.20	675
July 27	Genesee river	Rochester	0.76	664
July 31	Genesee river	Rochester	0.60	666
Aug. 19	Genesee river	Rochester	0.49	597
Aug. 26	Genesee river	Rochester	0.40	512
Aug. 27	Canandaigua outlet	Alloway	403.78	55.9
Aug. 27	Canandaigua outlet	Alloway	403.85	58.5
Nov. 19	Canaseraga creek	Hermitage farm bridge	6.55	245
Nov. 19	Canaseraga creek	Hermitage farm bridge	6.61	258
Nov. 19	Canaseraga creek	Hermitage farm bridge	6.65	267
1919				
June 9	Erie canal	South Greece	....	532
June 9	Erie canal	South Greece	....	454
June 20	Erie canal	South Greece	....	431

HUDSON RIVER DRAINAGE BASIN

DESCRIPTION OF BASIN

The principal sources of the Hudson river lie in the wildest portion of the Adirondack mountains, in Essex county, northeastern New York. A number of branches, any one of which might possibly be considered the main stream, form its upper waters; but if the highest collected and permanent body of water be assumed as the true head, then the source of the Hudson becomes Lake Tear-of-the-Clouds, which lies at an elevation of 4,322 feet above tide, in the center of the triangle formed by Mount Marcy, Skylight and Gray peaks.

The river flows rather irregularly southward until it reaches the northern boundary of Saratoga county, where it makes a sharp turn and flows eastward for about 12 miles, passing through the mountains and forming, as it cuts across the rocky strata, several falls of great height and beauty. At Hudson Falls, just below Glens Falls, it makes another abrupt turn and flows southward, continuing in this direction until it empties into New York bay.

From Lake Tear-of-the-Clouds to the mouth of the river the distance by water is probably about 300 miles. The total area drained is 13,366 square miles. The river is tidal to Troy, which is also at the head of navigation.

The headwater region is mountainous in character, is in general heavily wooded and is dotted with numerous lakes and ponds. The rocks, belonging to the oldest formation and mainly granitic, are either bare or covered only with a layer of spruce duff, humus and forest litter. The river emerges from the mountain region a few miles west of Glens Falls and from there to Troy the topography is moderately rolling and the soil is chiefly sand. Below Troy the river follows the great depression which extends almost due north and south between New York bay and the St. Lawrence, flowing in an open valley bordered by well-cultivated lands, which rise with moderate slope from the stream. The Catskill Mountain

region is reached 20 or 30 miles below Albany and thence to the mouth of the river the immediate valley is flanked by high hills, the Highlands of Orange county, and the precipitous Palisades being especially noticeable.

The fall in the upper portion of the course is very rapid, amounting to about 64 feet per mile from Lake Tear-of-the-Clouds to the mouth of North creek, a distance of about 52 miles. From the mouth of North creek to the mouth of the Sacandaga the descent is nearly 14 feet per mile, distributed among rapids which diminish in frequency as the Sacandaga is approached. In the succeeding 26 miles to Fort Edward the river descends 418 feet more. One hundred and seventy-five feet is comprised within the three abrupt pitches at Palmer, Glens, and Bakers Falls, while most of the remainder occurs in the rapids between Jessup's Landing and the oxbow above Glens Falls. Between Glens Falls and Troy nearly the entire fall of the river is utilized for the development of water-power. Between Fort Edward and Troy the Hudson river is canalized as part of the Barge canal system for practically the entire distance.

The tributaries of the Hudson are numerous and many of them are large and important. Indian river, Schroon river and the Sacandaga unite with the main stream above Glens Falls and between the latter point and Troy it receives Batten kill, Fish creek, Hoosic river and the Mohawk, the latter having several important tributaries, including West and East Canada and Schoharie creeks. The tributaries below Troy include Catskill, Esopus and Rondout creeks and Wallkill river from the west and Kinderhook creek, Jansen kill, Wappinger creek, Fishkill creek and Croton river from the east.

Below Troy the bed of the Hudson river is depressed below tide-water level. The stage of the stream is controlled by tidal action, by the inflow of the main stream and by the lateral drainage jointly.

The mean annual precipitation on the total basin of the Hudson is probably about 43 inches. It reaches a maximum of more than 55 inches in the heights of the Adirondacks, while in the

eastern portion of the drainage area, in southern Vermont, the mean annual total is only about 39 inches. Conditions during the winter period vary from the extreme cold and deep snow of the Adirondacks to the areas in the southern portion of the basin, which are subject to frequent winter thaws.

The flow of the upper Hudson is controlled to some extent during the dry season by the use of Indian lake storage reservoir. The natural storage facilities in the Adirondack region, tapped on the east and south by the upper Hudson and the Mohawk, are unsurpassed, there being a great many ponds and lakes, many of large size and fed from extensive drainage areas.

The longest run-off record in the Hudson river drainage basin is that obtained at the upper dam at Mechanicville, which extends back to 1888.

HUDSON RIVER

In the following pages will be found tables giving the daily discharge and monthly run-off of the Hudson river above Troy and of its tributaries at a considerable number of locations. These records are derived from various sources, which are indicated for records other than those maintained by this Department.

As to records of the Hudson river and tributaries it can only be said at this time that they are probably more consistent than would appear from a direct comparison. In some cases where the recorded run-off per square mile at adjacent stations differs, it does not necessarily follow that either one of the records is incorrect. There are wide variations in the hydrological conditions in different portions of the upper Hudson drainage basin. For example, the topography, culture, geology and soil for the Hudson and its tributaries above North Creek are all essentially different from the corresponding features of the drainage basin of Saratoga lake outlet. The hydrological features of both the above mentioned basins are essentially different from the corresponding features of the drainage basins of the Batten kill and Hoosic river. The conditions are somewhat further complicated by

diversions from the Hudson river to supply the Champlain canal through Glens Falls feeder and at Northumberland dam.

The Hudson river has been canalized for the Barge canal between Troy and Fort Edward with the exception of short distances at Stillwater and Northumberland and between the Fort Miller and Crocker's reef dams, where the canal is located on the east bank for a distance of about 2.5 miles. Four existing dams and three new ones, together with the necessary dredging, create a series of pools with low-water navigable surfaces at elevations, referred to Barge canal datum, as follows:—

Above the new Federal dam at Troy, Elev. 15.2.— The old State dam at Troy has been removed, having been replaced by the new Federal dam, completed November 18, 1915, about 1,400 feet further upstream. The old State dam was a timber crib dam with a straight fixed crest about 1,080 feet long at an elevation averaging 13.5 (12.6 M. S. L.) on which flash-boards were usually maintained to Elev. 15.2 (14.3 M. S. L.). The new dam built by the Federal Government and located at the foot of Bond street is a concrete structure of the ogee type. The crest has a broken trace and consists of two main arms, one two feet higher than the other. The east and lower section abuts on the new lock and lies across and normal to the main channel, with a crest length of 586 feet at Elev. 15.2 (14.33 M. S. L.). Provision is made in this lower crest for the use of flash-boards two feet in height. The west and higher section extends obliquely downstream to an ice-pass adjacent to the power head-gates on the west bank. The crest of the higher section is 669 feet long and at Elev. 17.2 (16.33 M. S. L.). The ice-pass, which is in line with the head-gates and parallel to the east section of the dam, provides an opening for the passage of ice, drift, etc., 25.5 feet wide, above Elev. 12.70 (11.83 M. S. L.), which will ordinarily be closed by flash-boards below crest of dam.

Above new dam No. 1, north of Waterford, Elev. 29.5.— This dam, located about 2.9 miles north of or upstream from the Waterford-Troy bridge across the Hudson river, consists of a concrete ogee crest totaling 602.5 feet at Elev. 29.5, having a

broken trace made up of two arms. The one adjacent and normal to Barge canal lock No. 1 on the right, or west bank is 100 feet long, the other, 502.5 feet in length, inclines downstream, and abutting it on the outer end is a battery of six Taintor gates, each having a clear span of 50 feet with sills at Elev. 15.0 lying normal to the direction of stream flow.

Above the lower dam at Mechanicville, Elev. 48.0.— This is an old dam now used by the Adirondack Electric Power Corporation.

Above the upper dam at Mechanicville, Elev. 67.5.— This is the old dam now used by the West Virginia Pulp and Paper Company, also known as the Duncan dam.

Above the old dam at Stillwater, Elev. 83.5.

Above the old dam at Northumberland, Elev. 102.5.— The river above the old dam at Fort Miller is not canalized.

Above the new dam at Crocker's reef, Elev. 119.0.— This dam is a concrete structure with a straight ogee crest in two sections. The east crest is 480 feet long and the west crest is 280 feet long, a total crest length of 760 feet at Elev. 119.0. This dam has an exceptionally level crest. There are no gates or power-wheels at this location and the entire flow of the river except that portion which is utilized for canal purposes at the Fort Miller lock and in the old Champlain canal, passes over the crest of the dam.

HUDSON RIVER NEAR INDIAN LAKE

Location.— About 1 mile below the mouth of Cedar river, 1½ miles above the mouth of Indian river and 6 miles northeast of Indian Lake village, Hamilton county.

Drainage area.— 418 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.—August 30, 1916, to June 30, 1919.

Gage.— Gurley printing water-stage recorder on right bank; inspected by John A. Bolton.

Discharge measurements.— Made from cable about 100 yards below gage or by wading.

Channel and control.— Solid ledge overlain with coarse gravel; probably permanent.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 8.70 feet, from 2 to 4 P. M., April 12; discharge, 10,400 second-feet. Minimum stage from water-stage recorder, 1.58 feet at 3 to 5 P. M., August 31; discharge, 96 second-feet.

1916–1919: Maximum stage from water-stage recorder, 9.87 feet at 11 A. M., June 12, 1917; discharge, 13,500 second-feet. Minimum stage from water-stage recorder, 1.43 feet, from 11 A. M., September 11, to 8 A. M., September 13, 1916; discharge, 56 second-feet.

Ice.— Stage-discharge relation affected by ice.

Regulation.— Large diurnal fluctuation due to logging operations during the spring months. Seasonal distribution of flow is slightly affected by storage.

Accuracy.— Stage-discharge relation practically permanent; affected by logs or ice from July through April. Rating curve fairly well defined between 75 and 600 second-feet and well defined between 600 and 6,000 second-feet. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying mean daily gage height to rating table, except when fluctuation required mean or hourly discharge. Records good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of HUDSON RIVER NEAR INDIAN LAKE, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 14	J. W. Moulton	2.78	696
Oct. 25 *a*	E. D. Burchard	3.12	956
1919			
Jan. 14 *b*	E. D. Burchard	2.94	389
Feb. 12 *b*	E. D. Burchard	2.47	240
Mar. 12 *b*	J. W. Moulton	3.64	585
Apr. 5	M. H. Carson	3.29	1,160
May 8	M. H. Carson	4.70	2,920
May 8	M. H. Carson	5.59	4,100
June 19	C. C. Covert	2.46	495

a A few logs on control.
b Ice on control.

Daily discharge, in second-feet, of HUDSON RIVER NEAR INDIAN LAKE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	313	216	195	1,100	2,480	850	800	300	240	1,500	2,000	1,150
2.....	524	229	224	932	2,600	750	700	280	260	1,200	2,000	665
3.....	482	234	336	810	2,220	700	700	280	280	1,000	2,000	488
4.....	562	211	290	735	1,750	600	650	280	300	800	2,000	416
5.....	595	195	252	735	1,440	550	600	240	280	1,000	2,000	399
6.....	500	187	247	772	1,240	562	550	240	360	1,290	2,000	372
7.....	428	171	379	1,120	1,060	735	550	240	460	1,750	2,000	491
8.....	383	167	434	3,490	932	772	500	240	440	2,470	2,000	700
9.....	351	175	372	3,660	810	735	480	240	420	2,510	1,630	630
10.....	356	238	305	2,600	772	630	440	240	480	3,360	1,770	476
11.....	405	440	247	1,860	772	665	400	200	550	5,250	1,200	394
12.....	530	440	211	1,540	772	850	380	220	550	9,490	1,200	367
13.....	665	367	203	1,340	700	890	380	200	500	6,400	1,200	336
14.....	735	315	211	1,340	665	700	380	200	500	5,270	1,200	315
15.....	735	252	199	1,060	630	595	360	220	420	2,830	4,010	367
16.....	595	238	224	777	562	975	400	240	400	2,960	4,210	508
17.....	530	183	280	595	530	1,060	500	220	400	4,000	1,930	772
18.....	500	157	361	530	595	1,100	380	260	460	2,750	2,100	735
19.....	446	146	688	506	1,200	1,290	280	240	900	2,000	2,700	506
20.....	399	142	772	494	1,800	1,290	320	220	1,100	1,890	1,930	388
21.....	356	135	735	476	1,920	850	260	220	1,100	2,820	1,560	325
22.....	315	128	810	562	1,700	665	220	220	1,000	1,560	1,620	524
23.....	276	132	772	824	1,390	890	180	220	950	1,160	2,760	665
24.....	247	125	700	1,240	1,100	1,290	280	240	800	1,650	3,780	512
25.....	229	122	770	1,200	890	1,340	600	260	650	1,740	2,200	305
26.....	211	115	735	975	735	1,390	600	280	600	3,390	2,200	234
27.....	191	109	1,060	890	630	1,240	480	280	700	1,470	2,200	382
28.....	171	102	1,290	975	562	1,150	400	260	1,600	1,360	2,200	470
29.....	160	102	1,290	1,060	750	1,020	340	......	1,100	2,520	2,200	351
30.....	203	102	1,240	975	900	950	320	......	2,400	2,100	2,200	310
31.....	247	105	......	1,060	......	850	300	......	1,900	......	2,200	......
Mean...	408	193	528	1,170	1,140	901	443	241	713	2,650	2,120	485

NOTE.— Stage-discharge relation affected by ice, December 30 to March 30. Daily discharge for this period is approximate. Daily discharge estimated, October 1, November 29 to December 5, March 31 to April 5, April 30, May 18 and 19 and June 1. Estimated mean daily discharge: 2,000 second-feet, May 1 to 8; 1,100 second-feet, May 11 to 14; 2,200 second-feet, May 25 to 31. Discharge estimated by comparing with hydrograph of Hudson at North Creek minus Indian river at Indian Lake.

Monthly discharge of HUDSON RIVER NEAR INDIAN LAKE, for the year ended June 30, 1919

[Drainage area, 418 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	735	160	408	0.976	1.13
August	440	102	193	0.462	0.53
September	1,290	195	528	1.26	1.41
October	3,660	476	1,170	2.80	3.23
November	2,600	530	1,140	2.73	3.05
December	1,390	550	901	2.16	2.49
January	800	180	443	1.06	1.22
February	300	200	241	0.577	0.60
March	2,400	240	713	1.71	1.97
April	9,490	800	2,650	6.34	7.07
May	4,210	1,100	2,120	5.07	5.84
June	1,150	234	485	1.16	1.29
The year	9,490	102	916	2.19	29.83

HUDSON RIVER AT NORTH CREEK

Location.— At the two-span steel highway bridge in the village of North Creek, Warren county, immediately above the mouth of North creek.

Drainage area.— 804 square miles.

Records available.—September 21, 1907, to June 30, 1919.

Gage.— Chain, at upstream side of left span of the bridge; read by William Alexander.

Discharge measurements.— Made from the upstream side of the highway bridge.

Channel and control.— Heavy gravel; fairly permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 8.50 feet at 7.30 A. M., April 12; discharge, about 13,800 second-feet. Minimum stage recorded, 2.25 feet at 8 A. M., July 24; discharge, 302 second-feet.

1907–1919: Maximum stage recorded, 12.0 during the evening of March 27, 1913; discharge, about 30,000 second-feet. Minimum stage, 2.05 feet at 7:05 A. M., September 30, 1913; discharge, 169 second-feet.

Ice.— Stage-discharge relation affected by ice.

Regulation.— The numerous lakes and ponds in the basin of the upper Hudson have a decided effect on the low-water flow, especially the reservoir at Indian lake. Many of the reservoirs are used to make flood waves in the spring in connection with log-driving.

Accuracy.— Stage-discharge relation practically permanent; usually affected by ice from December to March, inclusive. Rating curve well defined between 250 and 6,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good during open-water period; fairly good during period when stage-discharge relation is affected by ice.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of HUDSON RIVER AT NORTH CREEK, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
		Feet	*Sec.-ft.*
1918			
July 13........	J. W. Moulton..................................	3.76	1,770
1919			
Jan. 14........	E. D. Burchard..................................	2.75	665
Feb. 10 *a*......	E. D. Burchard..................................	3.31	1,160
May 9........	O. W. Hartwell..................................	5.46	4,780
May 9........	O. W. Hartwell..................................	4.59	3,280

a A little shore ice on control.

Daily gage height, in feet, of HUDSON RIVER AT NORTH CREEK, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	2.42	2.9	3.1	3.3	5.0	3.4	3.2	3.2	3.2	4.5	4.6	4.1
2.....	2.7	2.9	3.15	3.2	4.6	3.3	3.15	3.2	3.25	4.2	3.4	3.6
3.....	2.65	2.9	3.2	3.25	4.3	3.2	3.4	3.2	3.3	4.0	4.4	3.75
4.....	2.85	2.9	3.05	3.05	4.3	3.2	3.25	3.15	3.45	3.9	4.2	3.1
5.....	2.9	3.25	2.9	3.05	4.0	3.1	3.1	3.1	3.4	3.7	5.2	2.8
6.....	2.8	3.1	2.9	3.45	3.5	3.0	3.1	3.1	3.3	3.7	5.5	2.7
7.....	2.7	3.0	3.0	5.2	3.3	2.9	3.0	3.25	3.1	4.6	3.95	2.8
8.....	2.6	2.9	3.1	5.3	3.3	2.9	3.0	3.4	3.1	5.0	5.6	3.1
9.....	2.6	3.05	3.2	4.7	3.25	2.85	2.9	3.4	3.1	4.9	5.2	3.0
10.....	2.6	3.1	3.1	4.0	3.2	2.8	2.8	3.4	3.1	5.5	4.6	2.9
11.....	2.7	3.2	3.1	3.8	3.2	2.8	2.85	3.25	3.15	7.0	3.65	2.7
12.....	2.85	3.2	3.05	3.6	3.2	2.8	2.8	3.3	3.1	8.4	3.75	2.6
13.....	3.75	3.1	3.0	3.5	3.1	2.8	2.8	3.3	3.05	6.7	3.7	2.6
14.....	3.6	3.1	3.0	3.4	3.0	2.8	2.75	3.25	2.9	5.6	3.9	2.6
15.....	3.6	3.0	2.8	3.2	2.95	2.95	2.8	3.3	2.9	5.0	3.8	2.8
16....	3.15	2.95	2.6	3.25	2.9	3.3	2.8	3.25	2.85	5.3	4.6	2.9
17.....	3.05	3.0	2.65	3.2	2.85	3.3	3.0	3.2	2.85	6.4	4.0	3.5
18.....	3.0	2.9	2.7	3.2	3.0	3.2	2.9	3.25	2.85	5.8	4.4	3.2
19.....	2.85	3.0	3.1	3.1	3.9	3.2	2.7	3.25	3.4	4.6	4.6	3.05
20.....	2.7	3.1	3.2	3.1	4.3	3.1	2.7	3.25	3.7	4.4	4.4	2.8
21.....	2.7	3.1	3.2	3.0	4.3	3.1	2.85	3.3	4.0	4.8	4.2	2.7
22.....	2.6	3.0	3.1	3.2	4.2	3.1	3.2	3.2	4.6	4.9	4.7	2.8
23.....	2.30	3.05	3.1	3.4	3.9	3.2	3.3	3.15	4.6	4.8	5.7	2.8
24.....	2.28	3.05	3.0	3.45	3.65	3.8	3.4	3.2	4.7	4.8	6.1	2.9
25.....	2.8	3.0	3.0	3.3	3.5	3.85	3.6	3.3	4.4	4.4	5.7	2.7
26.....	2.9	3.0	3.05	3.2	3.3	3.85	3.7	3.2	4.2	4.9	5.4	2.75
27.....	2.75	3.0	3.6	3.2	3.2	3.7	3.5	3.15	4.9	4.4	5.6	2.85
28.....	2.8	3.0	3.7	3.4	3.2	3.4	3.5	3.2	5.6	4.3	4.7	3.15
29.....	2.8	3.0	3.65	3.4	3.2	3.3	3.4	......	5.6	5.1	4.2	2.8
30.....	2.9	2.95	3.5	3.35	3.4	3.25	3.3	......	5.5	4.6	4.0	2.7
31.....	3.0	2.95	......	4.7	......	3.2	3.25	......	5.0	......	3.7	......

Daily discharge, in second-feet, of HUDSON RIVER AT NORTH CREEK, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	404	790	990	1,220	4,010	1,350	1,100	1,100	1,100	3,050	3,230	2,370
2	610	790	1,040	1,100	3,280	1,220	1,040	1,100	1,160	2,530	1,350	1,620
3	570	790	1,100	1,160	2,700	1,100	1,350	1,100	1,220	2,210	2,870	1,840
4	745	790	940	940	2,700	1,100	1,160	1,040	1,420	2,060	2,530	990
5	790	1,160	790	940	2,210	990	990	990	1,350	1,760	4,440	700
6	700	990	790	1,420	1,480	890	990	990	1,220	1,760	5,120	610
7	610	890	890	4,440	1,220	790	890	1,160	990	3,230	2,140	700
8	530	790	990	4,660	1,220	790	890	1,350	990	4,010	5,360	990
9	530	940	1,100	3,420	1,160	745	790	1,350	990	3,810	4,440	890
10	530	990	990	2,210	1,100	700	700	1,350	990	5,120	3,230	790
11	610	1,100	990	1,910	1,100	700	745	1,160	1,040	9,100	1,690	610
12	745	1,100	940	1,620	1,100	700	700	1,220	990	13,800	1,840	530
13	1,840	990	890	1,480	990	700	700	1,220	940	8,240	1,760	530
14	1,620	990	890	1,350	890	700	655	1,160	790	5,360	2,060	530
15	1,620	890	700	1,100	840	840	700	1,220	790	4,010	1,910	700
16	1,040	840	530	1,160	790	1,220	700	1,160	745	4,660	3,230	790
17	940	890	570	1,100	745	1,220	890	1,100	745	7,400	2,210	1,480
18	890	790	610	1,100	890	1,100	790	1,160	745	5,840	2,870	1,100
19	745	890	990	990	2,060	1,100	610	1,160	1,350	3,230	3,230	940
20	610	990	1,100	990	2,700	990	610	1,160	1,760	2,870	2,870	700
21	610	990	1,100	890	2,700	990	745	1,220	2,210	3,610	2,530	610
22	530	890	990	1,100	2,530	990	1,100	1,100	3,230	3,810	3,420	700
23	330	940	990	1,350	2,060	1,100	1,220	1,040	3,230	3,610	5,600	700
24	319	940	890	1,420	1,690	1,910	1,350	1,100	3,420	3,610	6,600	790
25	700	890	890	1,220	1,480	1,980	1,620	1,220	2,870	2,870	5,600	610
26	790	890	940	1,100	1,220	1,980	1,760	1,100	2,630	3,810	4,840	655
27	655	890	1,620	1,100	1,100	1,760	1,480	1,040	3,810	2,870	5,360	745
28	700	890	1,760	1,350	1,100	1,350	1,480	1,100	5,360	2,700	3,420	1,040
29	700	890	1,690	1,350	1,100	1,220	1,350	......	5,360	4,220	2,530	700
30	790	840	1,480	1,280	1,350	1,160	1,220	......	5,120	3,230	2,210	610
31	890	840	......	3,420	......	1,100	1,160	......	4,010	......	1,760	......
Mean	764	912	1,010	1,610	1,650	1,110	1,020	1,150	2,020	4,280	3,300	886

NOTE.— Stage-discharge relation not affected by ice.

Monthly discharge of HUDSON RIVER AT NORTH CREEK, for the year ended June 30, 1919

[Drainage area, 804 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	1,840	319	764	0.950	1.10
August	1,160	790	912	1.13	1.30
September	1,760	530	1,010	1.26	1.41
October	4,660	890	1,610	2.00	2.31
November	4,010	745	1,650	2.05	2.29
December	1,980	700	1,110	1.38	1.59
January	1,760	610	1,020	1.27	1.46
February	1,350	990	1,150	1.43	1.49
March	5,360	745	2,020	2.51	2.89
April	13,800	1,760	4,280	5.32	5.94
May	6,600	1,350	3,300	4.10	4.73
June	2,370	530	886	1.10	1.23
The year	13,800	319	1,643	2.04	27.74

HUDSON RIVER AT THURMAN

Location.— At the Delaware & Hudson Railroad bridge near the Thurman railroad station, Warren county, about ½ mile below the mouth of Schroon river and about 13 miles above the mouth of Sacandaga river.

Drainage area.— 1,550 square miles.

Records available.— September 1, 1907, to June 30, 1919.

Gage.— Chain, at upstream side near center of left span; read by S. H. Spencer.

Discharge measurements.— Made from the upstream side of the bridge.

Channel and control.— Sand and gravel; fairly permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 8.25 feet at 9 A. M., April 12; discharge, 18,600 second-feet. Minimum stage recorded, 2.4 feet at 9 A. M., July 28; discharge, 460 second-feet.

1907–1919: Maximum stage, 12.5 feet during the late evening of March 27, 1913, determined by leveling from flood marks; discharge, about 46,000 second-feet. Minimum stage recorded, 2.12 feet at 8:55 A. M. and 6:20 P. M., September 30, 1913; discharge, about 290 second-feet.

Ice.— Stage-discharge relation affected by ice. Winter discharge determined from records at North Creek and Riverbank.

Regulation.— Discharge is regulated to some extent by the storage reservoirs at Indian lake and Schroon lake and the mills on the Schroon river.

Accuracy.— Stage discharge relation practically permanent; usually affected by ice during large part of the period from December to March, inclusive. Rating curve well defined between 550 and 20,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results good. Estimated results during frozen period fairly good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission. Gage heights furnished by the International Paper Company.

Discharge measurements of HUDSON RIVER AT THURMAN, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 12	J. W. Moulton	2.82	985
Oct. 26	E. D. Burchard	3.41	1,980
Nov. 15	E. D. Burchard	3.38	2,030
1919			
Feb. 13 *a*	E. D. Burchard	4.75	1,470
Mar. 13 *b*	J. W. Moulton	4.12	2,050
May 10	M. H. Carson	4.43	4,460

a Nearly complete ice cover on control. *b* Partial ice cover on control.

Daily gage height, in feet, of HUDSON RIVER AT THURMAN, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	2.7	2.9	3.0	3.4	5.1	3.75	3.45	3.8	5.7	5.2	4.1	4.0
2	3.05	2.8	3.05	3.15	4.8	3.6	3.7	3.9	5.1	4.9	3.9	3.95
3	3.15	2.85	3.0	3.0	4.6	3.6	3.65	3.9	4.6	4.8	4.1	3.7
4	2.8	2.8	3.0	3.05	4.4	3.6	3.65	4.0	4.8	4.9	4.2	3.7
5	2.9	3.05	2.8	3.1	4.3	3.5	3.4	4.1	4.8	4.5	5.7	3.4
6	2.9	2.95	2.8	3.25	4.1	3.4	7.0	4.0	4.9	4.5	4.8	3.1
7	2.8	2.9	2.8	4.3	3.95	3.45	7.9	4.0	4.4	5.0	4.7	3.05
8	2.8	2.9	2.8	5.1	3.85	3.4	7.9	4.0	4.2	5.2	4.5	3.2
9	2.7	2.9	3.1	4.7	3.7	3.3	7.3	4.0	4.0	5.5	5.7	3.45
10	2.7	2.9	3.0	4.2	3.6	3.3	6.3	4.0	4.6	5.8	4.2	3.4
11	2.7	2.85	2.95	3.85	3.6	3.25	6.5	4.0	4.5	6.4	4.0	3.3
12	2.65	3.05	2.95	3.75	3.45	3.2	5.8	4.0	4.3	8.2	4.8	3.25
13	3.3	3.0	2.9	3.75	3.35	3.4	6.0	4.4	4.3	7.0	4.2	3.15
14	3.5	2.95	3.05	3.65	3.35	3.35	6.1	5.0	4.0	6.5	4.4	3.3
15	3.5	2.95	3.4	3.5	3.3	3.55	5.8	4.8	3.8	6.0	4.0	3.05
16	3.3	2.85	2.6	3.05	3.35	3.6	5.8	4.7	3.8	5.7	4.2	3.2
17	3.05	2.8	2.65	3.0	3.3	3.7	5.9	4.1	3.8	6.0	4.1	3.8
18	3.0	2.65	2.9	3.3	3.35	3.6	5.6	4.0	4.0	6.2	4.8	3.5
19	3.0	2.75	2.95	3.1	4.3	3.4	5.2	5.0	4.0	5.4	5.1	3.4
20	3.0	2.9	3.1	3.05	4.5	3.35	4.7	5.2	4.1	4.9	4.8	3.35
21	2.85	3.0	3.35	2.95	4.6	3.3	4.7	5.3	4.4	5.1	4.6	3.15
22	2.7	2.8	3.2	3.15	4.5	3.35	5.2	5.9	4.8	5.0	4.8	3.1
23	2.65	2.9	3.1	3.3	4.3	3.5	5.6	5.3	4.8	4.8	5.9	3.1
24	2.6	2.95	3.1	3.5	4.2	3.8	5.8	5.0	4.8	4.9	6.2	3.1
25	2.6	3.0	3.0	3.5	4.0	3.8	5.6	4.9	4.8	4.2	6.0	3.1
26	2.9	2.85	3.1	3.45	3.85	4.0	5.8	4.8	4.7	4.7	5.8	2.9
27	2.75	2.85	3.75	3.35	3.7	4.0	5.9	4.4	4.7	4.7	5.9	3.35
28	2.4	2.8	3.7	3.45	3.65	3.85	5.4	5.3	6.2	4.6	5.4	3.25
29	2.9	2.85	3.6	3.45	3.65	3.55	5.3	......	5.7	4.9	4.8	3.1
30	2.9	2.85	3.55	3.5	3.7	3.5	4.7	......	5.9	4.4	4.6	3.0
31	3.0	2.8	......	4.6	......	3.3	4.4	......	5.6	......	4.3	......

Daily discharge, in second-feet, of HUDSON RIVER AT THURMAN, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	850	1,220	1,380	2,010	6,460	2,780	2,120	......	......	6,780	3,610	3,360
2	1,300	1,080	1,460	1,530	5,540	2,440	2,660	......	......	5,840	3,120	3,240
3	1,500	1,150	1,380	1,280	4,950	2,440	2,550	......	......	5,540	3,610	2,660
4	950	1,080	1,380	1,360	4,390	2,440	2,550	......	......	5,840	3,860	2,660
5	1,100	1,460	1,080	1,440	4,120	2,220	2,010	......	......	4,670	8,440	2,010
6	1,100	1,300	1,080	1,720	3,610	2,010	......	......	......	4,670	5,540	1,440
7	950	1,220	1,080	4,120	3,240	2,120	......	......	......	6,150	5,240	1,360
8	950	1,220	1,080	6,460	3,000	2,010	......	......	......	6,780	4,670	1,620
9	850	1,220	1,550	5,240	2,660	1,810	......	......	......	7,760	8,440	2,120
10	850	1,220	1,380	3,860	2,440	1,810	......	......	......	8,790	3,860	2,010
11	850	1,150	1,300	3,000	2,440	1,720	......	......	......	11,000	3,360	1,810
12	800	1,460	1,300	2,780	2,120	1,620	......	......	......	18,400	5,540	1,720
13	1,700	1,380	1,220	2,780	1,910	2,010	......	......	......	13,300	3,860	1,530
14	2,200	1,300	1,460	2,550	1,910	1,910	......	......	......	11,400	4,390	1,810
15	2,200	1,300	2,150	2,220	1,810	2,330	......	......	......	9,500	3,360	1,360
16	1,700	1,150	850	1,360	1,910	2,440	......	......	......	8,440	3,860	1,620
17	1,300	1,080	905	1,280	1,810	2,660	......	......	......	9,500	3,610	2,890
18	1,300	905	1,220	1,810	1,910	2,440	......	......	......	10,200	5,540	2,220
19	1,200	1,020	1,300	1,440	4,120	2,010	......	......	......	7,430	6,460	2,010
20	1,200	1,220	1,550	1,360	4,670	1,910	......	......	......	5,840	5,540	1,910
21	1,000	1,380	2,040	1,200	4,950	1,810	......	......	......	6,460	4,950	1,530
22	850	1,080	1,740	1,530	4,670	1,910	......	......	......	6,150	5,540	1,440
23	800	1,220	1,550	1,810	4,120	2,220	......	......	......	5,540	9,140	1,440
24	750	1,300	1,550	2,220	3,860	2,890	......	......	......	5,840	10,200	1,440
25	850	1,380	1,380	2,220	3,360	2,890	......	......	......	3,860	9,500	1,440
26	1,220	1,150	1,550	2,120	3,000	3,360	......	......	......	5,240	8,790	1,130
27	1,020	1,150	2,800	1,910	2,660	3,360	......	......	......	5,240	9,140	1,910
28	680	1,080	2,600	2,120	2,350	3,000	......	......	......	4,950	7,430	1,720
29	1,220	1,150	2,400	2,120	2,550	2,330	......	......	......	5,840	5,540	1,440
30	1,220	1,150	2,200	2,220	2,660	2,220	......	......	......	4,390	4,950	1,280
31	1,380	1,080	......	4,950	......	1,810	......	......	......	......	4,120	......
Mean	1,160	1,200	1,530	2,390	3,310	2,290	......	......	......	7,380	5,650	1,870

NOTE.— Discharge, July 1 to 24 and September 27 to 30, somewhat uncertain because of logs on the control. Stage-discharge relation affected by ice, January 6 to March 31.

Monthly discharge of HUDSON RIVER AT THURMAN, for the year ended June 30, 1919

[Drainage area, 1,550 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	2,200	680	1,160	0.748	0.86
August	1,460	905	1,200	0.774	0.89
September	2,800	850	1,530	0.987	1.10
October	6,460	1,200	2,390	1.54	1.78
November	6,460	1,810	3,310	2.14	2.39
December	3,360	1,620	2,290	1.48	1.71
January	....	....	1,960	1.26	1.45
February	....	....	1,710	1.10	1.14
March	....	....	3,950	2.55	2.94
April	18,400	3,860	7,380	4.76	5.31
May	10,200	3,120	5,650	3.65	4.21
June	3,360	1,130	1,870	1.21	1.35
The year	....	....	2,867	1.85	25.13

NOTE.— Mean discharge for the period, January 6 to March 31, determined by comparison with sum of records at North Creek and Riverbank.

HUDSON RIVER AT CORINTH

Gage No. 129

This station was established October 1, 1906, and is maintained in coöperation with the United States Weather Bureau. It is located at the mouth of Sturdevant creek on the right bank of the Hudson river about ¼ mile upstream from the highway bridge across the Hudson river in the village of Corinth.

On June 26, 1917, a standard Type A gage, No. 129, was secured to the north abutment of an abandoned highway bridge at the mouth of the creek, replacing the gage secured to the south abutment of the same bridge. The gage has a range of 14 feet and the datum is arbitrary.

It is read twice daily — at about 8 A. M. and 5 P. M.— to tenths.

Daily gage height, in feet, of HUDSON RIVER AT CORINTH, for the year ended June 30, 1919. E. H. Bowker, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	0.4	0.0	0.5	1.45	3.8	1.45	2.1	2.55	2.55	4.55	2.5
2	0.5	0.2	0.85	1.05	3.75	1.3	2.2	2.5	2.85	4.0	2.6
3	0.5	0.3	1.0	0.8	3.55	1.3	2.3	2.5	3.05	3.6	2.95
4	0.5	0.3	0.7	0.7	3.1	1.55	2.3	2.5	3.2	3.35	3.15
5	0.4	0.3	0.3	0.55	2.75	1.9	2.2	2.45	3.2	3.1	3.45
6	0.4	0.3	0.4	1.3	2.55	2.3	1.8	2.25	3.2	3.35	3.6
7	0.4	0.3	0.3	2.2	2.35	2.1	1.65	2.2	2.9	3.65	3.85
8	0.4	0.3	0.3	2.9	2.0	2.05	1.7	2.1	2.2	4.0	3.1
9	0.3	0.3	0.25	2.6	1.75	2.25	1.75	2.2	2.15	4.35	3.85
10	0.3	0.3	0.2	2.35	1.7	2.45	1.95	2.2	2.5	4.65	3.25
11	0.3	0.45	0.3	1.8	1.8	2.2	2.2	2.2	2.75	5.2	3.15
12	0.3	0.6	0.3	1.6	1.7	2.3	2.2	2.3	2.65	7.0	3.35
13	0.3	0.45	0.3	1.35	1.35	2.65	2.2	2.4	2.6	7.05	3.4
14	0.45	0.35	0.3	1.15	1.15	2.9	2.35	2.5	2.35	6.35	3.4
15	0.5	0.3	0.3	0.95	1.1	3.15	2.4	2.5	2.2	5.7	3.1
16	0.6	0.3	0.2	0.75	1.1	3.3	2.55	2.35	2.35	5.35	3.0
17	0.8	0.3	0.2	0.55	1.2	3.2	2.85	2.2	2.65	5.15	2.9
18	0.8	0.3	0.2	0.5	1.35	3.15	2.9	2.35	2.85	4.7	3.05
19	0.8	0.3	0.3	0.5	2.3	2.9	2.85	2.4	2.8	4.3	3.1
20	0.8	0.3	0.45	0.65	3.0	3.05	2.75	2.4	3.0	4.05	3.1
21	0.65	0.3	0.65	0.85	3.1	3.2	2.7	2.5	3.5	3.75	3.15
22	0.45	0.3	0.7	1.05	3.0	3.35	2.75	2.5	4.0	3.85	3.45
23	0.1	0.3	0.55	1.25	2.7	3.55	2.85	2.4	4.1	3.8	4.5
24	0.5	0.3	0.5	1.4	2.55	3.75	3.2	2.3	4.2	3.65	5.0
25	0.75	0.3	0.6	1.05	2.2	3.95	3.5	2.3	4.1	3.3	5.05
26	0.8	0.3	0.9	0.9	1.95	4.0	3.5	2.15	4.45	3.3	4.6
27	0.8	0.3	1.9	1.0	1.6	3.75	3.45	2.0	4.9	3.15	4.4
28	0.75	0.3	2.2	1.0	1.6	3.45	3.4	2.1	5.6	2.8	4.1
29	0.4	0.4	1.95	1.15	1.6	2.9	3.1	......	5.45	3.15	3.45
30	0.1	0.25	1.7	1.3	1.6	2.5	2.85	......	5.2	3.0	2.9
31	0.0	0.2	......	2.2	......	2.0	2.75	......	4.95	......	2.45

NOTE.— Station discontinued, May 31, 1919.

HUDSON RIVER AT SPIER FALLS

Location.— One-half mile below the Spier Falls dam, Saratoga county, and 11½ miles below mouth of Sacandaga river.

Drainage area.— 2,800 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— October 7, 1912, to June 30, 1919.

Gage.— Gurley 2-day water-stage recorder, in brick shelter, 5 feet square, on the right bank. Recorder inspected by R. F. Malone, chief operator of the power-plant.

Discharge measurements.— Made from a cable about 1,000 feet down-stream from the gage.

Channel and control.— Bed composed of coarse gravel and boulders; probably permanent.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 11.64 feet at 1 A. M. and 6 A. M., April 13; discharge, 32,000 second-feet. Minimum stage, 0.94 foot at 5 A. M. and 7 A. M., September 1, 1918; discharge, 140 second-feet.

1912–1919: Maximum stage from water-stage recorder, 18.59 feet, at 12:25 A. M., March 28, 1913; discharge, about 89,100 second-feet. Minimum stage, −0.12 foot at 4 P. M., September 23, 1917, observed during current-meter measurement; discharge, about 5.5 second-feet.

Ice.— Stage-discharge relation not affected by ice except for a short time during extremely cold periods.

Regulation.— Large diurnal fluctuation in discharge, due to operation of the Spier Falls power-plant. Seasonal flow affected by storage at Indian lake and many small lakes and reservoirs in the upper part of the drainage basin.

Diversions.— Water is diverted from Hudson river through the Glens Falls feeder and the old Champlain canal into the summit level of the Barge canal. A portion flows north into Lake Champlain. No correction has been made for this diversion.

Accuracy.— Stage-discharge relation practically permanent; rating curve well defined for all stages except at about 9 feet, where curve may be 4 per cent or 5 per cent large. Operation of the water-stage recorder satisfactory throughout the year. Daily discharge ascertained by averaging the results obtained by applying

gage heights for one-hour intervals to the rating table. Records good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission. Water-stage recorder inspected by an employee of the Adirondack Electric Power Corporation.

Discharge measurement of HUDSON RIVER AT SPIER FALLS, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
May 11........	O. W. Hartwell....................................	5.99	8,380

Daily discharge, in second-feet, of HUDSON RIVER AT SPIER FALLS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	1,810	1,480	906	4,070	12,600	4,940	5,230	3,190	2,070	15,700	7,480	5,900
2.....	1,700	1,540	1,940	3,700	12,200	4,610	6,080	2,810	3,790	13,200	8,500	6,280
3.....	2,780	1,120	2,350	2,780	11,000	3,860	6,570	3,230	4,150	11,300	9,120	4,480
4.....	1,590	1,390	1,790	3,290	9,730	4,170	6,480	2,890	4,250	10,400	9,880	4,220
5.....	1,260	1,530	1,690	2,750	8,570	4,020	4,480	2,860	5,030	9,680	12,000	3,910
6.....	1,510	1,490	1,650	2,210	7,510	3,700	3,980	2,980	5,530	9,810	11,400	2,760
7.....	1,510	1,670	1,530	4,810	6,430	2,670	3,810	2,990	5,350	11,600	12,600	2,310
8.....	1,910	1,430	922	8,320	6,240	1,670	4,050	2,180	5,070	13,700	9,230	1,640
9.....	1,480	1,590	1,980	7,340	4,620	4,280	4,030	2,160	5,570	15,600	13,500	3,170
10.....	1,250	1,060	2,060	5,900	4,430	2,700	3,900	3,420	7,820	16,200	9,150	3,080
11.....	1,410	1,600	1,700	4,500	4,420	2,980	3,150	2,660	7,820	19,800	8,900	3,080
12.....	1,850	1,710	1,430	4,100	5,250	2,420	2,900	2,270	7,210	29,400	9,530	3,060
13.....	2,080	1,880	1,770	3,780	3,770	2,940	3,240	2,330	7,320	30,900	9,910	2,650
14.....	2,690	1,680	1,850	3,960	3,490	3,400	2,250	2,540	6,200	26,700	9,290	2,360
15.....	3,690	1,570	725	3,480	3,230	3,500	3,040	2,120	5,500	22,100	9,040	1,390
16.....	2,880	1,840	1,970	2,920	3,500	5,380	2,820	1,710	4,990	18,000	8,350	3,190
17.....	2,470	1,050	1,360	2,440	2,730	5,720	3,200	3,240	4,760	18,800	8,400	3,370
18.....	2,410	1,230	1,410	2,310	3,940	5,250	3,010	2,740	5,230	18,700	9,420	3,830
19.....	2,730	1,810	1,950	2,460	7,600	4,680	2,700	2,430	7,600	15,400	11,800	3,310
20.....	2,240	1,450	2,410	1,620	9,700	4,230	2,500	2,170	9,080	14,300	10,500	3,000
21.....	1,400	1,380	3,390	2,470	9,770	3,400	2,300	2,720	11,200	12,700	9,260	2,460
22.....	1,690	1,430	1,600	3,590	8,960	3,410	2,640	1,700	13,500	12,600	10,700	1,820
23.....	1,480	1,440	2,310	3,630	7,940	5,500	2,850	1,400	13,900	9,780	16,300	2,760
24.....	1,310	606	2,340	4,370	6,910	6,700	4,040	2,740	14,400	10,100	18,100	2,100
25.....	1,330	1,410	2,230	3,740	6,060	9,290	4,700	2,300	14,800	8,940	18,500	1,920
26.....	1,440	1,690	2,620	4,050	5,190	12,100	5,030	2,230	13,200	9,420	16,700	1,860
27.....	1,480	1,400	5,410	2,800	4,760	11,500	5,020	2,390	13,100	9,270	16,200	2,280
28.....	1,290	1,440	6,100	4,130	3,260	9,900	4,670	2,340	21,200	7,620	13,600	2,780
29.....	1,420	1,350	5,350	3,740	4,580	8,240	4,200	......	20,300	8,430	10,900	3,800
30.....	1,590	1,200	4,650	4,240	4,720	6,640	3,940	......	20,000	7,790	8,640	3,140
31.....	1,530	1,520	......	7,230	......	5,240	3,680	......	18,300	......	7,340	......
Mean...	1,850	1,450	2,310	3,880	6,440	5,130	3,890	2,530	9,300	14,600	11,100	3,060

Monthly discharge of HUDSON RIVER AT SPIER FALLS, for the year ended June 30, 1919

[Drainage area, 2,800 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	3,690	1,250	1,850	0.661	0.76
August	1,880	606	1,450	0.518	0.60
September	6,100	725	2,310	0.825	0.92
October	8,320	1,620	3,880	1.38	1.59
November	12,600	2,730	6,440	2.30	2.57
December	12,100	1,670	5,130	1.83	2.11
January	6,570	2,250	3,890	1.39	1.60
February	3,420	1,400	2,530	0.904	0.94
March	21,200	2,070	9,300	3.32	3.83
April	30,900	7,620	14,600	5.21	5.81
May	18,500	7,340	11,100	3.96	4.56
June	6,280	1,390	3,060	1.09	1.22
The year	30,900	606	5,462	1.95	26.51

HUDSON RIVER AT VARNEY FARM, ABOVE GLENS FALLS

Gage No. 128

This station, established January 27, 1914, is located on the left bank of the Hudson river about 3 miles upstream from the feeder dam at Glens Falls. The gage, originally a vertical staff attached to a pine tree about 800 feet north of the fence running toward the river from the barn on the Varney farm, was replaced in November, 1916, by a standard Type A gage, No. 128, having a range of 12 feet, between elevations 281.0 and 293.0. A nail was driven in the tree at elevation 290.0 (B. C. datum) for a reference point.

The gage is read twice daily — morning and afternoon — to tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER AT VARNEY FARM, ABOVE GLENS FALLS, for the year ended June 30, 1919. Henry B. Palmer, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	*a*	282.75	283.6	285.5	287.45	285.8	285.65	284.7	282.3	287.7	285.5
2	*a*	283.0	284.75	285.15	287.45	285.7	286.05	283.0	*a*	287.6	285.65
3	*a*	282.55	285.65	284.3	287.25	285.25	286.2	283.95	*a*	287.0	285.65
4	*a*	282.95	285.05	284.7	286.95	285.35	286.15	283.4	*a*	286.65	285.85
5	*a*	283.8	284.4	284.1	286.55	284.85	285.5	283.2	*a*	286.5	286.75
6	*a*	283.55	283.3	282.5	286.35	283.6	*a*	283.35	*a*	286.45	286.35
7	*a*	283.55	283.4	285.75	286.15	282.6	*a*	283.35	*a*	286.8	286.8
8	*a*	283.95	282.4	286.35	285.95	281.95	*a*	283.15	*a*	286.35	285.6
9	*a*	284.1	284.2	286.2	285.45	284.6	285.25	281.95	*a*	286.7	287.15
10	*a*	283.6	285.0	285.75	284.9	283.15	284.85	283.4	*a*	287.85	286.25
11	*a*	283.3	284.1	285.35	284.5	282.75	284.6	283.9	286.35	288.3	285.7
12	*a*	285.05	283.75	284.5	285.1	282.0	283.7	282.85	286.4	290.15	285.85
13	*a*	284.95	283.15	283.7	284.3	282.1	283.55	281.95	286.15	290.45	286.0
14	*a*	284.55	284.05	284.7	283.1	282.7	282.75	282.95	286.05	289.65	285.75
15	*a*	284.2	283.05	284.55	284.5	283.2	283.2	282.35	285.85	288.7	286.1
16	*a*	284.15	284.35	284.65	284.95	285.8	283.65	281.5	285.65	287.75	285.5
17	*a*	283.55	283.45	283.75	282.9	286.05	284.0	282.0	285.7	287.9	285.7
18	*a*	282.95	282.45	283.3	285.35	285.85	283.9	282.95	285.75	287.95	285.7
19	*a*	284.6	283.05	283.0	286.1	285.6	283.7	282.95	286.3	287.05	285.5
20	*a*	284.15	283.95	282.95	286.7	285.1	284.15	281.95	286.7	286.85	285.3
21	*a*	283.6	285.3	283.75	286.9	284.35	283.3	281.85	287.25	287.5	285.7
22	*a*	283.4	283.85	283.95	286.75	282.95	283.0	281.75	287.8	286.55	286.3
23	*a*	283.8	283.4	284.95	286.45	285.8	283.1	281.95	287.75	286.15	287.7
24	282.0	282.9	282.95	285.45	286.2	286.2	283.65	282.25	287.6	285.7	288.3
25	283.2	282.6	283.55	284.85	285.95	286.55	284.7	282.65	287.95	285.4	288.75
26	284.4	284.25	284.95	284.05	285.8	287.25	285.65	282.7	287.55	285.6	288.25
27	285.3	283.75	285.9	281.75	285.4	287.3	285.85	282.3	287.5	285.65	288.2
28	284.8	283.8	286.25	285.45	283.5	287.2	285.65	282.3	288.8	285.3	287.8
29	284.55	283.7	286.15	284.2	285.8	286.45	285.45	......	288.7	285.25	286.6
30	284.25	283.8	285.95	284.75	285.75	286.25	285.3	......	288.6	285.35	285.6
31	283.45	283.55	......	285.75	......	285.75	285.0	......	288.3	......	284.4

NOTE.— Station discontinued May 31, 1919. *a* Readings uncertain.

HUDSON RIVER AT GLENS FALLS

Gage No. 127

This station, located above the feeder dam at Glens Falls, was established March 9, 1905, and is maintained in coöperation with the U. S. Weather Bureau. A vertical staff on crib near left bank about 500 feet above dam is read to tenths twice daily — at 8 A. M. and 5 P. M.

In connection with the enlargement of the Glens Falls feeder to supply the summit level of the Champlain branch of the Barge canal system the feeder dam was reconstructed. A new concrete structure with an ogee crest at elevation 282.0 and 615 feet in length, including a logway 20 feet wide at elevation 280.0 with provision for flash-boards to crest, was built immediately below the old timber-crib dam, which had a very irregular crest averaging elevation about 281.0 and being about 618 feet long. There are large bulkheads for power purposes at each end of the dam.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER ABOVE FEEDER DAM AT GLENS FALLS, for the year ended June 30, 1919. A. B. Fisher, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	283.0	283.4	283.65	285.4	287.05	285.6	285.55	284.65	281.8	286.95	284.55	283.9
2.....	282.35	282.8	284.75	284.95	287.05	285.7	286.0	283.8	283.85	286.05	284.75	284.1
3.....	283.55	282.75	285.7	284.25	286.75	284.95	285.95	283.85	285.1	286.35	284.75	283.6
4.....	284.5	282.5	285.05	284.4	286.65	284.9	286.05	283.65	285.3	286.2	285.05	283.55
5.....	283.05	284.0	284.45	284.7	286.4	284.3	285.85	283.45	285.55	286.25	285.4	284.2
6.....	282.5	283.7	283.8	282.4	286.25	283.25	285.4	283.55	285.75	286.1	285.3	284.25
7.....	282.0	283.4	283.4	285.7	286.0	283.45	285.0	283.4	285.85	286.35	285.65	283.8
8.....	283.95	283.75	283.05	286.25	285.85	281.6	285.2	282.75	285.7	286.65	284.85	283.6
9.....	283.25	284.1	284.15	286.1	285.6	284.4	285.2	281.35	285.65	287.0	285.85	284.7
10.....	281.25	283.85	284.95	285.6	284.25	283.15	284.7	283.5	286.25	287.1	285.15	284.95
11.....	282.25	283.35	284.1	285.15	284.45	281.85	284.65	283.7	286.25	287.4	285.05	284.85
12.....	283.15	285.1	283.85	284.25	284.9	281.35	283.55	282.55	286.15	288.25	284.95	283.6
13.....	283.5	284.95	282.95	283.7	284.4	282.2	282.95	282.25	286.15	288.0	285.2	284.4
14.....	283.95	284.55	284.1	284.05	282.85	283.15	283.45	282.1	285.95	287.55	285.0	283.85
15.....	285.85	284.04	283.2	284.35	284.25	282.9	283.25	281.95	285.8	286.9	285.15	283.05
16.....	285.55	284.1	284.2	284.65	284.85	285.7	283.9	281.4	285.6	286.3	284.9	284.5
17.....	284.85	283.85	283.35	283.8	282.9	285.9	283.85	282.8	285.85	286.4	284.95	283.15
18.....	284.3	282.95	282.1	283.25	284.95	285.8	283.65	283.1	285.8	286.4	284.9	285.75
19.....	283.85	284.65	282.85	283.0	285.8	285.6	283.65	282.7	286.25	285.9	285.45	285.55
20.....	284.45	284.15	283.5	282.45	286.55	285.45	283.8	281.75	286.35	285.7	285.35	284.85
21.....	283.45	283.6	285.2	283.85	286.65	284.15	283.0	282.25	286.75	285.5	285.15	283.7
22.....	283.6	283.3	283.45	284.0	286.45	283.1	282.6	281.55	287.2	285.55	285.3	282.9
23.....	283.05	283.65	283.4	284.7	286.25	285.65	283.0	281.0	287.25	284.95	286.15	284.3
24.....	282.75	283.45	282.8	285.35	286.0	286.15	284.3	281.85	287.35	284.95	286.5	284.15
25.....	283.8	282.65	282.75	284.9	285.9	286.6	285.45	281.9	287.35	284.75	286.05	283.5
26.....	284.55	284.3	283.7	283.95	285.7	287.05	285.4	282.0	287.1	284.8	286.35	283.6
27.....	284.85	283.85	285.65	282.15	285.3	286.95	285.55	282.15	287.05	284.9	286.25	283.95
28.....	285.05	283.5	286.2	285.35	283.7	286.65	285.45	282.1	286.85	284.45	285.9	283.2
29.....	284.5	283.65	285.95	284.65	285.65	286.3	285.25	......	287.65	284.45	285.35	283.6
30.....	284.15	283.75	285.85	284.6	285.7	286.05	285.25	......	287.6	284.75	284.75	284.6
31.....	282.9	283.65	......	285.6	......	285.75	285.05	......	287.3	......	284.3	......

GLENS FALLS FEEDER AT GLENS FALLS

Location.— Slope station in upper end of canal.

Records available.— Continuous records from May 17 to June 30, 1919. Occasional current-meter measurements previous to 1919.

Gages.— Two Gurley 7-day water-stage recorders with scales of 2 to 1 for gage height. The float wells are 1½ by 2 feet, inside dimension, located with the bottoms about 2 feet below normal pool elevation. They are about 3½ miles apart. Gage No. 1 is located on the right bank just below the intake lock. Gage No. 2 is located on the left bank just below the highway bridge crossing to the cement mills. Both gages were inspected by Fred B. Kraft of the State Engineer's Department.

Discharge measurements.— Made from the first change bridge below intake to canal.

Regulation.— Flow in canal is regulated by gates at intake.

Ice.— No flow in canal during frozen season.

Accuracy.— The values of the coefficients as determined appear to be consistent. Daily discharge as computed is considered to fairly represent the facts. Except on some days when there is considerable diurnal fluctuation, results are believed to be good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of GLENS FALLS FEEDER AT GLENS FALLS, during the year ended June 30, 1919

DATE	Made by	GAGE HEIGHT		Discharge
		Gage No. 1	Gage No. 2	
1919		*Feet*	*Feet*	*Sec.-ft.*
May 21	J. W. Moulton	280.584	280.090	188
May 22	J. W. Moulton	280.568	279.995	185
May 23	J. W. Moulton	280.595	279.742	244
May 23	J. W. Moulton	280.497	279.948	184

Daily gage height, in feet, of GAGE No. 1, GLENS FALLS FEEDER, AT GLENS FALLS, for the year ended June 30, 1919

DAY	May	June	DAY	May	June	DAY	May	June
1		280.516	11		281.084	21	280.540	281.094
2		280.554	12		281.044	22	280.526	281.070
3		280.604	13		281.054	23	280.502	281.136
4		280.520	14		281.076	24	280.444	281.316
5		280.766	15		281.132	25	280.482	281.324
6		280.880	16		281.326	26	280.410	281.360
7		280.880	17	280.566	281.180	27	280.400	281.480
8		280.876	18	280.470	281.218	28	280.396	281.390
9		280.968	19	280.658	281.150	29	280.578	281.436
10		280.958	20	280.604	281.136	30	280.620	281.430
						31	280.600	

Daily gage height, in feet, of GAGE No. 2, GLENS FALLS FEEDER, AT GLENS FALLS, for the year ended June 30, 1919

DAY	May	June	DAY	May	June	DAY	May	June
1		279.778	11		280.08	21	279.962	279.994
2		279.750	12		280.08	22	279.936	279.974
3		279.848	13		280.08	23	279.858	279.990
4		279.682	14		280.10	24	279.796	280.098
5		279.906	15		280.158	25	279.842	280.176
6		280.084	16		280.246	26	279.706	280.166
7		280.09	17	279.784	280.052	27	279.688	280.300
8		280.08	18	279.914	280.118	28	279.670	280.084
9		280.07	19	280.074	279.976	29	279.862	280.340
10		280.03	20	280.010	279.996	30	279.94	280.178
						31	279.70	

HUDSON RIVER BELOW LOCK No. 7, FORT EDWARD

Gage No. 119

This station was originally established as "Hudson river at Bridge street, Fort Edward" and so maintained from April 11, 1904, to November 14, 1915, when it was discontinued and a new record begun at the Fort Edward canal terminal, about 550 feet farther upstream. On August 26, 1918, the gage, No. 119, was removed to lock No. 7, about 3/4 mile downstream, and established in two sections on the east wall below the lock. It has a range of 14.5 feet. The limits are between elevations 119.0 and 127.0 for the lower section and between elevations 127 and 133.5 for the upper section. A standard bench-mark plug is set in the wall near the lower section at elevation 126.0 (B. C. datum).

The gage is read twice daily to half-tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER BELOW LOCK No. 7, FORT EDWARD, for the year ended June 30, 1919. F. H. Wells and W. H. Newton, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	119.90	120.80	120.60	121.58	123.2	121.25	121.30	120.75	121.10	123.62	121.65	121.25
2.....	119.90	120.70	120.56	121.42	123.32	121.38	121.60	120.82	120.30	123.15	121.80	121.35
3.....	119.98	120.75	121.05	121.30	123.00	121.25	121.65	120.70	120.72	122.75	121.95	120.90
4.....	120.32	120.60	121.08	120.88	122.80	121.00	121.65	120.55	120.72	122.55	122.20	120.65
5.....	120.80	120.65	120.98	121.35	122.50	121.20	121.60	120.58	120.90	122.28	122.25	120.58
6.....	120.88	120.88	121.00	120.75	122.30	120.90	121.28	120.40	121.05	122.10	122.60	120.40
7.....	120.58	120.75	120.82	121.20	122.05	120.90	120.80	120.50	121.00	122.52	122.85	120.18
8.....	120.72	120.75	120.65	122.45	121.80	120.08	120.75	120.42	120.95	122.95	122.60	119.98
9.....	120.90	120.82	120.58	122.38	121.70	120.15	121.02	120.18	120.98	123.40	122.75	120.12
10.....	120.92	120.85	120.88	122.00	121.32	121.10	120.90	120.38	121.92	123.52	122.25	120.45
11.....	120.72	120.65	120.88	121.70	121.40	121.05	120.80	120.52	121.78	124.15	121.95	120.32
12.....	120.62	120.60	120.85	121.58	121.62	120.80	120.45	120.28	121.50	126.28	122.08	120.35
13.....	120.85	120.82	120.85	121.35	121.58	120.80	120.50	120.32	121.42	127.00	122.32	120.30
14.....	120.78	120.98	120.80	121.40	121.10	120.92	120.52	120.38	121.45	126.32	122.02	120.20
15.....	121.45	120.95	120.65	121.35	121.05	121.22	120.48	120.42	121.25	125.28	122.15	120.30
16.....	121.22	120.88	120.70	121.20	121.20	121.40	120.50	119.60	120.90	124.15	121.72	121.35
17.....	121.18	120.82	120.92	121.00	120.80	121.55	120.60	120.22	121.00	124.20	121.95	121.50
18.....	121.12	120.55	120.75	120.98	121.58	121.70	120.72	120.55	120.90	124.25	122.00	121.80
19.....	121.15	120.55	120.78	120.92	121.75	121.52	120.20	120.38	121.58	123.55	122.45	121.60
20.....	121.20	120.85	120.92	120.80	122.60	121.12	120.80	120.30	121.80	123.35	122.40	121.42
21.....	120.75	120.78	121.35	120.85	122.65	121.08	120.52	120.32	122.35	122.88	122.15	121.25
22.....	120.78	120.80	121.25	121.10	122.42	120.80	120.45	120.35	122.82	122.90	122.30	120.95
23.....	120.85	120.75	120.90	121.32	122.20	121.50	120.52	120.10	122.90	122.30	123.45	121.08
24.....	120.70	120.72	121.10	121.40	121.90	121.92	121.20	120.28	123.15	122.12	123.90	121.10
25.....	120.52	120.40	121.00	121.45	121.85	*a*	121.22	120.32	123.35	122.00	124.20	121.10
26.....	120.65	120.50	121.15	121.55	121.55	123.20	120.88	120.40	122.98	121.95	124.20	120.95
27.....	120.70	120.75	121.80	121.12	121.32	122.90	121.45	120.20	122.80	122.00	123.55	120.90
28.....	120.72	120.82	122.28	121.10	120.78	122.58	121.18	120.82	124.95	121.72	123.35	120.65
29.....	120.85	120.75	121.85	121.45	121.40	122.05	121.10	......	124.60	121.60	122.52	121.52
30.....	120.90	120.75	121.90	121.38	121.35	122.20	120.95	......	124.50	121.82	121.90	121.65
31.....	120.82	120.75	......	121.80	......	122.60	120.72	......	124.30	......	121.62	......

a No record.

HUDSON RIVER AT CROCKER'S REEF DAM

Gage No. 118

Location.—At Crocker's reef dam across the Hudson river at the head of Thompson island about 6 miles below Fort Edward and about 2.2 miles above the dam at Fort Miller.

Drainage area.— 2,959 square miles.

Records available.— Water-surface elevations, April 11, 1904, to June 30, 1919. Discharge, September 1, 1907, to June 30, 1918. Dam completed, August 27, 1907.

Gage.— The original gage was attached to an elm tree about 450 feet above the dam, on the east bank of the river. On July 17, 1915, a staff gage was located on the east side of the north end of the pier at the guard-gate and used until November, 1916, when it was replaced by a standard Type A gage, No. 118, which has a range of 12 feet, between elevations 118.0 and 130.0. A standard bench-mark plug is set in the pier near the gage at elevation 130.0 (B. C. datum). This gage indicates water-surface elevations practically equivalent to that at junction of canal and river, about 2,500 feet above, and is read twice daily to tenths — at 7 A. M. and 4 P. M. or 8 A. M. and 5 P. M.— and published in the accompanying table. From January 8, 1916, to November 30, 1916, the old gage on the elm tree was read once daily simultaneously with a third reading of the guard-gate gage.

Discharge computations.—Discharge estimates are based on theoretical computations, using a varying coefficient and correcting for submergence. Velocity of approach has not been allowed for, as it was assumed that the surface slope from the gage to the dam would be approximately equivalent to the head due to velocity of approach.

Control.— Crest of dam at elevation 119.0, 760 feet long in two straight sections separated by head of island — the east, 480 feet, and the west, 280 feet in length. The dam is of concrete with an ogee crest carefully troweled to a uniform level for use as a gaging weir. This dam is free from gates or power-wheels. Dur-

ing higher stages the dam is submerged by backwater from the dam at Fort Miller.

Extremes of discharge.— 1907–1918: Maximum stage recorded, on March 28, 1913, at 4 P. M.; discharge, 72,800 second-feet. A considerably higher stage is believed to have been reached earlier in the day. The 8:00 A. M. reading was not made. Minimum stage recorded, elevation 119.26 on June 19, 1913, at 7:00 A. M. and 5 P. M.; discharge, 280 second-feet.

Diversion.— During the navigation season water is diverted above this station to supply the new Barge canal lock at Fort Miller. Except for the above the entire flow of the Hudson river passes over the dam.

Regulation.— Daily flow affected somewhat by local storage above power dams at Fort Edward and Glens Falls.

Accuracy.— Discharge for current year has been reduced upon the same basis as used in former years. Allowance for submergence has been based upon estimated water-surface below the dam, and actual conditions as observed indicate that with about three feet of water over the dam there is somewhat more submergence than has been allowed. From July 26, 1915, to January 8, 1916, and since December 1, 1916, a correction, varying with the gage height, has had to be applied to records obtained at the guard-gate in the Barge canal, to obtain the water-surface elevation above the dam. This correction has been taken from a curve drawn by plotting the elevations at the guard-gate as abscissas and the difference between the simultaneous readings at the guard-gate gage and the river gage as ordinates.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER ABOVE CROCKER'S REEF DAM, for the year ended June 30, 1919. John H. Donnelly, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	119.75	120.55	120.6	121.6	122.6	121.0	121.0	120.35	120.9	122.75	121.45	120.95
2.....	119.8	120.55	120.55	121.5	122.8	121.15	121.25	119.9	120.35	122.4	121.55	121.2
3.....	119.95	120.55	120.95	121.55	122.6	121.0	121.2	120.55	120.55	122.05	121.55	120.7
4.....	120.8	120.4	120.85	121.0	122.5	120.95	121.1	120.35	120.6	121.95	121.55	120.5
5.....	120.75	120.55	120.85	121.15	122.15	121.05	120.9	120.5	120.7	121.75	121.85	120.3
6.....	120.7	120.55	120.9	121.05	122.0	120.95	120.95	120.3	120.9	121.7	122.0	120.3
7.....	120.7	120.6	120.95	121.35	121.7	120.55	120.55	120.4	120.85	121.9	122.0	120.3
8.....	120.7	120.45	120.45	122.1	121.65	120.15	120.6	120.35	120.8	122.2	121.85	119.9
9.....	120.75	120.75	120.65	122.1	121.55	120.05	120.65	120.1	120.95	122.55	122.1	120.05
10.....	120.75	120.85	120.8	121.9	121.3	120.9	120.55	120.3	121.5	122.6	121.75	120.2
11.....	120.55	120.7	120.85	121.6	121.2	120.7	120.6	120.35	121.45	123.05	121.55	120.3
12.....	120.55	120.8	120.95	121.5	121.35	120.8	120.35	120.25	121.25	124.55	121.5	120.2
13.....	120.75	120.8	120.8	121.3	121.45	120.7	120.35	120.3	121.2	125.05	121.6	120.15
14.....	120.7	120.8	120.8	121.4	121.05	120.85	120.85	120.3	121.05	124.65	121.5	120.1
15.....	121.05	120.75	120.7	121.3	120.9	120.75	120.3	120.4	120.95	123.8	121.45	120.35
16.....	121.1	120.65	120.65	121.1	121.05	121.25	120.3	120.15	120.6	123.1	121.45	121.35
17.....	121.05	120.65	120.8	121.1	120.9	121.3	120.4	120.2	120.7	123.1	121.5	121.5
18.....	121.1	120.5	120.8	121.0	121.45	121.3	120.55	120.4	120.85	123.15	121.6	121.45
19.....	121.0	120.5	120.8	120.95	122.05	121.1	120.15	120.3	121.0	122.75	121.85	121.5
20.....	121.1	120.6	120.85	120.7	122.35	120.95	120.3	120.2	121.55	122.6	121.75	121.4
21.....	120.65	120.65	121.05	120.9	122.25	120.95	120.35	120.25	121.85	122.25	121.7	121.3
22.....	120.6	120.7	121.1	121.15	122.2	120.6	120.25	120.25	122.2	122.15	121.95	121.4
23.....	120.65	120.6	120.95	121.2	122.0	121.2	120.35	119.95	122.25	121.75	122.55	121.6
24.....	120.6	120.6	121.15	121.35	121.65	121.65	120.85	120.15	122.4	121.65	123.1	121.6
25.....	120.5	120.45	120.95	121.35	121.5	122.1	120.8	120.3	122.5	121.55	123.05	121.05
26.....	120.55	120.6	121.15	121.35	121.4	122.6	120.4	120.3	122.25	121.35	122.95	120.9
27.....	120.6	120.7	121.7	121.2	121.2	122.35	120.95	120.2	122.2	121.6	122.8	120.95
28.....	120.85	120.6	122.0	121.05	120.75	122.0	120.85	120.2	123.4	121.4	122.5	120.95
29.....	120.8	120.8	121.85	121.35	121.2	121.8	120.8	......	123.45	121.35	122.0	121.25
30.....	120.85	120.75	121.55	121.35	121.2	121.7	120.75	......	123.4	121.35	121.5	121.45
31.....	120.7	120.7	......	121.5	......	121.9	120.65	......	123.15	......	121.25	......

HUDSON RIVER ABOVE DAM AT FORT MILLER

Gage No. 116

This station, established April 11, 1904, is located on the east bank of the Hudson river above the dam at Fort Miller. A board staff gage attached to a crib about 300 feet above the screen racks was transferred to the side wall of the head-race near the screen racks in 1913. In November, 1916, a standard Type A gage, No. 116, in two sections, was erected. The gage has a range of 12 feet, the lower section, attached to the side of the screen rack, reading from elevation 113.0 to elevation 121.0, and the upper section, attached to the side of the mill building, reading from elevation 121.0 to elevation 125.0. This dam has not been affected by Barge canal construction.

The gage is read twice daily — at 7 to 8 A. M. and 5 to 6 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER ABOVE DAM AT FORT MILLER, for the year ended June 30, 1919. W. L. Sanders, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	115.45	115.2	115.3	116.0	117.2	116.1	116.1	116.0	116.25	117.6	116.65	116.5
2	115.3	115.25	115.0	115.85	117.3	116.0	116.5	115.35	116.1	117.35	116.6	116.5
3	115.25	115.2	115.15	115.7	117.25	115.85	116.3	115.6	115.8	117.2	116.7	116.2
4	115.6	115.15	115.25	115.45	117.1	115.75	116.3	115.35	115.85	117.0	116.95	115.95
5	115.55	115.15	115.25	115.35	116.8	115.85	116.6	115.4	115.85	116.85	117.2	115.75
6	115.65	115.2	115.3	115.9	116.55	115.6	116.2	115.35	115.95	117.0	117.2	115.65
7	115.4	115.0	115.0	115.7	116.35	115.7	115.75	115.4	116.2	116.9	117.25	115.6
8	115.45	114.85	115.35	116.55	116.3	115.5	115.75	115.5	116.05	117.25	116.85	115.65
9	115.6	114.95	114.85	116.6	116.15	114.95	115.95	115.45	116.6	117.5	117.1	115.5
10	115.6	115.0	115.15	116.4	115.8	115.35	115.8	115.6	116.9	117.7	117.0	115.8
11	115.4	115.3	115.3	116.1	116.2	115.6	115.85	115.35	116.75	117.95	116.9	115.6
12	115.3	114.9	115.1	116.0	116.05	115.7	115.75	115.4	116.7	118.8	116.8	115.5
13	115.55	115.15	115.1	116.1	115.9	115.55	115.75	115.4	116.5	119.2	116.9	115.55
14	115.6	115.2	114.95	116.1	115.7	115.75	115.75	115.45	116.55	119.0	116.7	115.4
15	116.15	115.1	115.4	115.95	115.55	116.05	115.45	115.55	116.8	118.15	116.8	115.35
16	115.95	115.1	115.15	115.7	115.8	116.15	115.65	115.7	116.65	117.85	116.55	115.35
17	115.9	115.1	115.2	115.45	115.75	116.3	115.7	115.75	116.3	118.0	116.75	115.65
18	116.0	115.4	115.1	115.45	115.95	116.35	115.7	115.55	116.2	117.9	116.95	115.9
19	115.8	115.3	115.1	115.4	116.7	116.2	115.75	115.4	116.6	117.55	117.1	115.7
20	115.8	114.95	115.15	115.8	116.95	116.05	115.65	115.4	116.75	117.65	117.0	115.55
21	115.65	114.9	115.6	115.5	116.9	115.9	115.55	115.15	117.0	117.25	116.9	115.6
22	114.95	114.95	115.85	115.6	116.8	115.4	115.4	115.15	117.35	117.1	117.05	115.6
23	115.4	114.9	115.4	115.9	116.75	116.2	115.45	115.4	117.55	116.85	117.5	115.4
24	115.4	114.95	115.45	116.05	116.7	116.5	116.05	115.15	117.45	116.9	117.85	115.4
25	115.45	115.5	115.3	115.9	116.45	116.95	116.0	115.35	117.4	116.85	118.0	115.2
26	115.35	114.75	115.45	116.0	116.3	117.2	116.2	115.45	117.2	116.7	117.9	115.3
27	115.4	114.85	116.25	116.1	116.05	117.1	116.0	115.4	117.1	117.0	117.65	115.05
28	115.4	114.95	116.45	115.7	115.65	116.8	116.0	115.35	118.2	116.7	117.45	115.35
29	115.45	115.4	116.5	115.9	115.9	116.9	115.9	......	118.15	116.5	117.15	115.95
30	115.5	115.15	116.1	115.95	116.0	116.8	115.8	......	118.2	116.65	116.85	115.9
31	115.4	114.8	......	116.15	......	116.85	115.75	......	117.95	......	116.55	......

HUDSON RIVER BELOW DAM AT FORT MILLER

Gage No. 115

This station, established May 1, 1904, was originally located on the wall near the tail-race of the paper company, on the east bank of the river. From April, 1911, to November, 1916, it was located below Barge canal lock No. 6, on the third crib from the lower approach wall. On November 21, 1916, a standard Type A gage, No. 115, in two sections, was erected. The gage has a range of 15 feet, the lower section, attached to the return of the east lower approach wall of lock No. 6, reading between elevations 102.0 and 110.0, and the upper section, attached to the east abutment of the highway bridge over the lower end of lock No. 6, reading between elevations 110.0 and 117.0. A standard benchmark plug is set near the lower section at elevation 109.0 (B. C. datum) and an "H" cut in concrete beside the upper section at elevation 114.0 (B. C. datum).

The gage is read twice daily — at 7 to 8 A. M. and 5 to 6 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER BELOW DAM AT FORT MILLER, for the year ended June 30, 1919. W. L. Sanders, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	102 95	103.75	104.1	104.8	106.1	104.45	104.6	104.35	104.8	106.15	104.5	104.15
2	103.6	103.55	104.05	104.65	106.2	104.35	105.0	103.55	103.7	105.45	104.45	104.2
3	103.5	103.75	104.1	104.55	106.2	104.4	105.0	104.25	103.7	105.3	104.3	103.75
4	103.85	103.9	104.25	104.3	106.0	104.3	105.25	104.0	103.7	105.05	104.95	103.4
5	104.0	103.65	104.15	104.65	105.65	104.3	104.95	104.15	103.8	104.75	105.15	103.25
6	104.1	103.7	104.1	104.5	104.45	104.35	104.7	104.05	104.05	104.9	105.25	103.15
7	103.8	103.75	103.7	104.6	105.25	104.3	104.25	104.05	104.45	105.1	105.3	103.1
8	103.4	103.95	104.2	105.55	105.2	103.8	104.15	103.95	104.1	105.45	104.75	103.85
9	103.55	103.95	103.5	105.65	104.9	102.75	104.45	103.25	104.35	105.7	105.2	103.85
10	103.6	103.85	103.9	105.3	104.8	104.35	104.15	103.85	104.85	105.9	104.95	104.1
11	103.25	103.95	104.05	105.05	104.95	104.15	104.0	103.8	104.7	106.45	104.8	103.85
12	102.8	103.7	103.9	104.95	104.85	103.85	103.3	103.7	104.5	108.2	104.7	103.8
13	103.75	104.05	103.95	104.9	104.6	103.5	104.1	103.6	104.45	108.85	104.8	103.85
14	104.15	104.1	103.45	104.75	103.35	104.1	103.8	103.35	104.65	108.5	104.6	103.75
15	104.6	104.05	104.2	104.6	103.25	104.7	103.35	103.8	104.75	106.65	104.7	103.4
16	104.3	103.95	104.1	104.3	103.3	104.95	103.7	103.8	103.7	105.45	104.35	103.55
17	104.2	103.75	104.05	104.35	103.4	104.85	103.75	103.4	103.9	106.55	104.5	104.2
18	104.25	104.2	104.0	104.3	103.35	104.9	104.0	104.15	103.95	106.75	104.8	104.45
19	104.1	103.65	103.4	104.2	105.25	104.55	103.35	103.9	104.45	105.85	105.1	104.3
20	104.05	103.75	103.5	104.35	105.75	104.4	103.95	103.35	104.7	106.0	104.95	103.45
21	104.05	103.85	104.45	104.1	105.75	104.45	103.75	102.9	105.05	105.45	104.75	102.9
22	103.7	103.55	104.75	104.25	105.6	104.3	103.75	103.35	105.55	105.4	105.0	103.05
23	103.6	103.6	104.45	104.4	105.45	104.9	103.6	102.8	105.65	104.95	105.75	103.3
24	103.7	103.4	104.35	104.45	105.35	105.15	104.8	102.65	105.6	105.0	106.25	103.75
25	103.25	104.0	104.35	104.4	105.1	105.9	104.7	103.85	105.7	104.7	106.55	103.1
26	103.45	103.85	104.5	104.45	104.65	106.0	104.65	103.9	105.6	104.6	106 35	103.1
27	103.4	103.35	105.25	104.6	104.1	105.9	104.85	103.1	105.3	104.95	106.15	102.9
28	104.1	103.5	105.45	104.15	104.0	105.85	104.65	103.25	107.0	104.4	105.7	103.55
29	104.2	103.45	105.35	104.55	104.6	105.65	104.6	......	106.95	104.25	105.2	104.4
30	104.2	103.35	105.1	104.4	104.25	105.3	104.5	......	106.9	104.6	104.6	104.55
31	103.95	103.2	......	104.75	......	105.6	104.4	......	106.6	......	104.45	....

HUDSON RIVER ABOVE LOCK No. 5, NORTHUMBERLAND

Gage No. 114

This station, established October 24, 1916, is located at the upper end of lock No. 5. Above lock No. 5 the canal follows a land-line for about one mile, entering the river above the dam at Northumberland. The water-surface indicated by this gage is practically that at the junction of the canal and river above the dam. The gage, No. 114, is a standard Type A gage, secured to the upper end of the east upper gate recess, and has a range of 11 feet, between elevations 100.0 and 111.0. A standard bench-mark plug is set in the wall near the gage at elevation 110.0 (B. C. datum).

The gage is read twice daily — at 8 A. M. and 4 P. M. — to half-tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER ABOVE LOCK 5, NORTHUMBERLAND, for the year ended June 30, 1919. G. W. Perkins, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	103.05	104.20	104.12	104.42	105.82	104.42	104.42	104.28	104.72	105.55	104.18	104.05
2	103.15	103.40	104.15	104.60	105.92	104.65	104.75	103.88	103.40	105.18	104.15	103.95
3	102.95	103.78	104.30	104.55	105.88	104.05	104.72	104.25	103.68	104.92	104.30	103.55
4	104.15	104.08	104.28	104.30	105.68	104.22	104.72	104.12	103.52	104.78	104.70	103.15
5	104.02	103.98	104.02	104.55	105.40	104.38	104.58	104.05	103.70	104.62	104.60	103.30
6	104.10	103.78	104.08	104.50	105.28	104.15	104.50	104.00	103.80	104.68	104.88	103.18
7	103.98	103.60	103.70	104.58	105.15	104.25	104.02	104.10	103.95	104.78	104.98	102.82
8	103.28	103.70	104.12	105.50	104.95	103.78	104.00	104.05	103.70	105.05	104.48	103.98
9	103.58	103.70	103.35	105.52	104.82	102.62	104.15	103.48	104.08	105.30	104.78	103.50
10	103.48	103.72	103.92	105.15	104.88	104.40	104.05	103.82	104.62	105.35	104.60	103.90
11	103.08	104.15	104.05	104.92	104.88	103.80	103.98	104.15	104.40	105.72	104.52	103.68
12	102.68	103.60	103.85	104.78	104.82	103.85	103.42	103.45	104.22	106.88	104.35	103.90
13	103.62	104.02	103.88	104.82	104.55	103.55	103.62	103.50	104.30	107.42	104.65	103.95
14	104.30	104.10	103.28	104.70	103.05	104.05	103.68	103.12	104.32	107.05	104.40	103.60
15	104.48	104.08	104.22	104.55	103.00	104.35	103.12	103.63	104.55	106.42	104.58	104.05
16	104.42	103.85	104.00	104.35	102.92	104.75	103.68	103.65	103.85	105.80	104.25	103.60
17	104.15	103.82	104.10	104.30	103.60	104.78	103.62	103.58	103.75	105.78	104.32	103.75
18	104.22	104.20	104.05	104.22	103.15	104.68	103.88	104.12	103.60	105.88	104.48	104.40
19	104.08	103.62	103.40	104.28	105.00	104.60	103.60	103.85	104.22	105.45	104.75	104.10
20	104.02	103.72	103.50	104.35	105.52	104.32	103.90	103.55	104.28	105.62	104.68	103.10
21	104.25	103.72	104.35	104.25	105.55	104.40	103.52	103.05	104.70	105.10	104.45	102.60
22	103.62	103.40	104.85	104.15	105.55	104.25	103.45	103.62	105.02	105.00	104.65	103.15
23	103.60	103.35	104.15	104.28	105.30	104.72	103.68	103.10	105.25	104.65	105.25	103.00
24	103.75	103.38	104.40	104.42	105.28	105.05	104.62	102.42	105.28	104.58	104.60	103.88
25	103.08	104.10	104.28	104.50	105.00	105.60	104.52	103.78	105.30	104.48	105.90	103.20
26	103.52	103.25	104.50	104.48	104.28	105.82	104.55	103.90	105.08	104.32	105.65	103.28
27	103.42	103.40	105.00	104.55	104.22	105.72	104.70	103.22	104.98	104.62	105.42	102.90
28	104.20	103.78	105.30	103.95	103.95	105.55	104.50	103.25	106.12	104.30	105.25	103.58
29	104.05	103.30	105.18	104.45	104.32	105.48	104.48	......	106.22	104.02	104.92	104.45
30	104.18	103.42	105.12	104.32	104.32	105.15	104.42	......	106.10	104.82	104.48	104.48
31	104.05	103.25	......	104.70	......	105.65	104.32	......	106.00	......	104.20	......

HUDSON RIVER BELOW LOCK No. 5, NORTHUMBERLAND

Gage No. 113

The concrete gage in the lock wall was read until November 19, when a standard Type A gage, No. 113, in two sections, was erected. The lower section is secured to the lower end of the east guide-wall and has a range of 12 feet, between elevations 82.0 and 94.0. The upper section is secured to the south end of the east lower thrust wall and has a range of 12 feet, between elevations 94.0 and 106.0. Standard bench-mark plugs are set in the wall near the gages, for the lower section at elevation 93.0 (B. C. datum) and for the upper section at elevation 97.0 (B. C. datum).

The gage is read twice daily — at 8 A. M. and 4 P. M. — to half-tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER BELOW LOCK No. 5, NORTHUMBERLAND, for the year ended June 30, 1919. G. W. Perkins, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	84.18	83.85	83.62	85.40	87.52	85.25	86.20	85.18	86.15	89.40	86.50	86.05
2	84.42	83.78	83.72	85.20	87.78	85.55	86.78	84.85	85.60	88.70	86.72	86.10
3	84.20	83.70	84.30	85.08	87.30	85.25	86.48	85.10	85.68	88.10	86.90	85.55
4	83.85	83.50	84.38	84.60	87.15	85.20	86.50	84.95	85.55	87.90	87.15	85.10
5	84.32	83.35	84.20	85.00	86.68	85.38	86.40	84.95	85.68	87.62	87.62	85.10
6	84.12	83.85	84.12	84.65	86.40	85.05	86.32	84.80	85.82	87.50	87.98	85.00
7	83.85	83.82	83.98	84.38	86.10	85.25	85.98	84.85	85.72	88.02	88.05	84.55
8	83.90	83.85	83.62	86.15	85.92	84.62	86.02	84.88	85.70	88.50	87.38	84.35
9	84.20	83.95	83.45	86.40	85.78	84.45	85.90	84.62	85.88	88.92	87.65	84.55
10	84.32	83.92	83.90	85.95	85.30	85.30	85.88	84.62	87.45	89.20	87.50	85.08
11	84.05	83.95	84.15	85.65	85.12	85.00	85.82	84.92	86.98	87.75	87.02	84.85
12	83.82	83.75	84.00	85.35	85.48	84.85	85.22	84.72	86.62	92.28	86.95	84.78
13	84.00	84.20	84.05	85.12	85.45	84.65	85.35	84.52	86.42	93.68	87.45	84.80
14	84.20	84.08	83.90	85.08	85.25	84.85	85.55	84.58	85.95	93.20	87.00	84.65
15	84.80	84.08	83.80	85.10	84.55	85.20	85.02	84.72	85.82	91.58	87.10	84.40
16	84.85	83.90	83.48	84.75	84.68	85.98	85.22	84.60	85.75	90.10	86.65	84.40
17	84.68	83.95	84.10	84.68	84.72	85.80	85.08	84.65	86.08	90.00	86.88	84.58
18	84.62	83.80	84.02	84.42	84.70	85.70	85.22	84.72	86.00	90.18	87.32	85.00
19	84.48	83.70	83.82	84.40	86.62	85.50	84.92	84.62	86.10	89.38	87.70	84.92
20	84.48	83.98	83.78	84.38	87.22	85.48	85.28	84.52	86.85	89.08	87.55	84.90
21	84.18	84.08	84.35	84.40	87.22	85.32	85.00	84.28	87.50	88.38	87.08	84.60
22	84.10	84.02	84.88	84.70	87.00	85.05	84.82	84.58	87.92	88.15	87.68	84.35
23	84.05	84.00	84.82	84.82	86.65	86.02	84.85	84.32	88.12	87.58	88.90	84.28
24	83.88	83.95	84.58	84.95	86.25	86.55	86.50	84.20	88.38	87.35	89.45	84.60
25	83.60	83.80	84.32	85.18	86.20	87.30	86.05	84.50	88.48	87.30	89.70	84.32
26	83.48	83.75	84.60	85.18	85.68	88.15	85.88	84.95	88.10	87.08	89.72	84.40
27	83.72	83.85	86.28	84.85	85.35	87.98	86.22	84.75	87.95	87.22	89.08	84.22
28	83.55	83.85	86.55	84.55	85.15	87.52	85.90	84.62	90.32	86.78	88.62	84.32
29	84.10	83.85	85.92	84.22	85.30	86.92	85.65	......	90.90	86.38	87.88	84.58
30	84.18	83.70	85.78	85.00	85.38	86.82	85.52	......	90.55	86.85	87.02	85.10
31	83.98	83.75	......	85.58	......	86.90	85.25	......	90.28	......	86.45	......

HUDSON RIVER AT FREE BRIDGE, LIBERTY MILLS

Gage No. 6A

This station, established October 23, 1905, is located on the highway bridge across the Hudson river commonly known as Free bridge, about 3/4 mile south, or downstream from the dam at Northumberland, about 1/4 mile above the mouth of Batten kill and about 1 1/4 miles above the village of Schuylerville. The gage is a standard chain gage located on the downstream side of the bridge and is read twice daily — at 6:30 A. M. and 5:30 P. M.— to tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER AT FREE BRIDGE, LIBERTY MILLS, for the year ended June 30, 1919. Wm. B. Dunstan and Byron H. Bennett, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	84.55	84.4	83.9	86.2	88.15	86.0	87.05	85.6	87.4	90.15	87.5	86.7
2	84.6	84.25	84.45	86.0	88.6	86.1	87.6	84.8	85.5	89.5	87.9	87.15
3	84.5	84.2	84.9	85.85	88.6	86.0	87.2	85.35	86.25	89.0	87.7	86.8
4	84.5	83.9	84.9	85.4	88.3	85.9	87.2	85.5	86.65	88.6	87.9	86.0
5	85.1	84.2	84.9	85.3	87.85	85.6	87.0	85.45	86.7	88.5	88.3	85.6
6	84.8	84.4	84.9	85.4	87.3	85.55	86.8	85.4	86.8	88.2	88.35	85.55
7	84.45	84.1	84.4	85.8	87.3	85.2	86.7	85.4	86.8	88.6	88.75	84.8
8	84.6	84.0	84.5	86.1	87.0	84.95	86.45	85.2	86.55	89.15	88.9	84.6
9	84.9	84.15	84.3	86.6	86.85	84.9	86.3	84.7	87.4	89.7	88.95	85.15
10	84.9	84.2	84.5	86.8	86.0	85.0	86.2	85.15	88.1	89.85	88.4	85.9
11	84.45	84.0	84.8	86.4	86.3	85.3	86.0	85.2	87.8	90.5	87.9	85.55
12	84.1	84.8	84.8	86.2	86.3	85.4	85.6	85.1	87.65	92.7	87.9	85.35
13	84.45	84.8	84.75	86.1	85.9	85.5	85.6	85.1	87.35	94.0	88.15	85.45
14	84.4	84.75	84.55	86.05	85.6	85.5	86.1	85.1	87.2	93.35	87.9	85.35
15	84.8	84.7	84.5	85.8	85.2	85.5	86.0	85.1	86.85	92.1	87.9	84.8
16	85.1	84.65	84.6	85.5	85.2	86.35	85.8	84.8	86.95	90.7	87.9	84.75
17	85.3	84.65	84.65	85.25	85.15	86.7	85.6	85.15	87.0	90.45	87.9	85.35
18	85.1	84.5	84.75	85.1	85.55	86.5	85.0	85.3	87.25	89.9	88.0	85.9
19	85.1	84.3	84.6	85.1	86.9	86.5	84.7	85.2	87.4	89.5	88.5	85.65
20	85.2	84.55	84.4	85.1	87.85	86.15	85.5	85.2	87.3	89.45	88.35	85.45
21	84.4	84.75	85.25	85.1	88.0	86.0	85.7	85.0	88.2	89.05	88.05	85.1
22	84.9	84.5	85.1	85.3	88.0	85.5	85.4	85.1	88.7	88.7	88.8	84.65
23	84.3	84.5	84.8	85.6	87.7	86.4	85.45	84.9	88.9	88.0	89.4	84.85
24	84.3	84.5	84.8	85.7	87.4	86.8	87.0	85.0	89.05	88.0	90.0	85.25
25	83.9	83.9	84.8	85.75	87.0	87.8	86.85	85.0	89.3	87.8	90.4	85.0
26	83.95	84.4	85.25	86.0	87.0	88.2	86.5	85.0	89.4	87.6	90.25	85.0
27	84.2	84.4	86.95	85.5	86.8	88.6	86.9	85.1	88.9	87.6	90.0	84.75
28	84.2	84.4	87.1	85.4	86.5	88.4	86.7	85.2	90.9	87.6	89.9	84.95
29	84.8	84.4	86.6	85.65	86.1	87.85	86.3	......	91.5	87.6	89.5	85.55
30	84.8	84.4	86.6	86.1	86.0	87.6	86.15	......	91.0	87.6	88.35	85.8
31	84.6	84.3	......	87.0	......	87.45	85.8	......	90.7	......	87.5	......

HUDSON RIVER AT TOLL BRIDGE, SCHUYLERVILLE

Gage No. 112

This station, established August 14, 1905, is located on the bridge across the Hudson river at Ferry street, Schuylerville, commonly known as Toll bridge. The gage is a standard chain gage located on the new truss across the Barge canal channel. The gage is read twice daily to tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER AT TOLL BRIDGE, SCHUYLERVILLE, for the year ended June 30, 1919. Charles Cheney, Observer

Day	July	Day	July	Day	July
1	84.55	11	84.35	21	84.5
2	84.65	12	84.15	22	84.45
3	84.45	13	84.2	23	84.45
4	84.3	14	84.4	24	84.2
5	84.45	15	84.75	25	83.85
6	84.4	16	85.1	26	83.85
7	84.3	17	84.75	27	83.95
8	84.25	18	84.95	28	......
9	84.4	19	84.8	29	......
10	84.5	20	84.65	30	......
				31	......

NOTE.— Station discontinued July 28, 1918.

HUDSON RIVER BELOW DAM AT STILLWATER

Gage No. 110

This station, established July 15, 1909, is located on the west bank of the Hudson river below the dam at Stillwater. The staff gage at the tail-race of the A. T. Pack grist-mill was replaced on August 17, 1916, by a standard Type A gage in the same location and having a range of 11½ feet, between elevations 74.0 and 85.5 (B. C. datum).

The gage is read twice daily — morning and afternoon — to tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER BELOW DAM AT STILLWATER, for the year ended June 30, 1919. John T. Morris, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	75.4	75.3	75.1	76.75	78.15	76.8	*a*	76.8	77.2	78.95	77.4
2	75.8	75.4	75.05	76.5	77.8	76.6	*a*	76.6	77.2	78.65	77.6
3	75.7	75.4	75.6	76.45	78.0	76.9	*a*	76.6	76.8	78.4	77.7
4	75.4	75.0	76.0	76.2	78.0	76.5	*a*	76.4	76.8	78.2	77.8
5	75.7	75.0	75.8	76.35	78.0	76.9	*a*	76.2	76.8	78.0	78.0
6	75.6	75.2	75.8	76.3	77.8	76.8	*a*	76.2	76.8	78.0	78.2
7	75.6	75.2	75.6	76.05	77.6	76.3	*a*	76.0	77.0	78.1	78.25
8	75.25	75.3	75.45	77.1	76.9	76.0	*a*	76.0	77.0	78.6	78.0
9	75.55	75.4	75.0	77.5	77.1	76.0	76.8	75.8	77.0	78.75	78.15
10	75.6	75.5	75.3	77.2	76.95	76.25	76.8	76.0	78.0	78.8	78.1
11	75.6	75.45	75.65	76.95	76.5	76.0	76.6	76.0	77.9	79.25	77.9
12	75.4	75.0	75.5	76.75	76.7	76.0	76.3	75.8	77.8	80.15	77.75
13	75.5	75.3	75.5	76.5	76.8	76.0	76.1	76.0	77.6	80.7	77.9
14	75.6	75.6	75.5	76.45	76.8	76.45	76.1	75.8	77.1	80.55	77.7
15	76.05	75.6	75.35	76.35	76.0	76.8	76.0	75.9	77.9	79.9	77.65
16	76.2	75.4	75.0	76.15	76.15	76.8	76.0	75.8	76.9	79.5	77.3
17	76.05	75.4	75.45	76.0	75.7	77.0	76.1	76.0	77.25	79.35	77.4
18	76.05	75.3	75.55	76.0	76.7	77.0	76.1	76.0	77.3	79.35	78.85
19	76.0	75.0	75.5	76.0	77.8	76.7	75.9	76.0	77.65	78.95	77.95
20	75.95	75.15	75.45	75.7	78.0	76.8	75.8	76.1	77.85	78.7	78.0
21	75.7	75.3	75.85	75.8	77.9	76.8	75.6	75.8	78.1	78.4	77.8
22	75.65	75.5	76.35	76.0	77.8	76.65	75.65	75.8	78.3	78.3	78.15
23	75.6	75.4	76.4	76.2	77.75	77.25	75.9	75.8	78.4	78.15	78.75
24	75.35	75.4	76.05	76.5	77.5	77.7	76.9	75.8	78.5	77.95	79.0
25	75.15	75.2	75.95	76.5	76.85	78.1	76.8	76.0	78.5	77.9	79.15
26	75.0	75.0	76.1	76.6	76.4	78.55	76.8	76.35	78.35	77.9	79.05
27	75.0	75.15	77.2	76.35	76.95	78.45	77.0	76.1	78.1	77.9	78.8
28	76.0	75.4	77.4	75.9	76.75	78.1	76.8	76.0	78.45	77.65	78.6
29	75.25	75.6	77.1	76.75	76.5	77.7	76.85	......	79.6	77.55	78.25
30	75.6	75.4	77.0	76.6	77.05	77.65	76.8	......	79.6	77.5	77.85
31	75.5	75.25	......	76.8	......	77.8	76.85	......	79.4	......	77.5

a No record.
NOTE.— Station discontinued May 31, 1919.

HUDSON RIVER ABOVE LOCK No. 4, STILLWATER

Gage No. 109

This station, established April 1, 1916, is located at the upper end of Barge canal lock No. 4 at Stillwater. Above the lock a land-line about 2,400 feet long joins the Hudson river about 1,400 feet above the dam. The water-surface indicated approximates that at this junction. The upper concrete staff gage in the lock was used until October 31. Since November 1 a standard Type A gage, No. 109, has been used. This gage is secured to the west upper gate recess and has a range of 12 feet, between elevations 81.0 and 93.0. A standard bench-mark plug is set in the wall near the gage at elevation 92.0 (B. C. datum).

The gage is read twice daily — at 8 A. M. and 3 P. M. — to half-tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER ABOVE LOCK No. 4, STILLWATER, for the year ended June 30, 1919. John O. Fordham, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	84.08	83.80	83.65	84.95	85.95	84.95	85.15	*a*	*a*	86.95	85.00	85.25
2.....	84.25	83.80	83.70	84.80	86.18	85.00	85.50	84.60	85.28	86.52	85.70	85.25
3.....	84.15	83.85	84.02	84.72	85.95	84.92	85.45	84.60	85.00	86.30	85.65	85.00
4.....	83.85	83.45	84.35	84.45	85.90	84.80	85.40	84.55	85.00	86.20	85.82	84.85
5.....	83.95	83.12	84.05	84.55	85.62	84.92	85.20	84.60	85.10	86.10	85.95	84.80
6.....	84.00	83.82	84.00	84.55	85.50	84.80	85.00	84.50	85.20	86.00	86.20	84.65
7.....	83.78	83.80	83.95	84.18	85.28	84.65	84.90	84.55	85.25	86.20	86.25	84.45
8.....	83.80	83.85	83.88	85.30	85.18	84.45	85.00	84.50	85.10	86.45	86.02	84.30
9.....	84.00	83.88	83.30	85.50	85.20	84.20	84.98	84.45	85.20	86.68	86.10	84.30
10.....	83.85	83.98	83.90	85.22	84.95	84.88	84.85	84.35	86.00	86.80	86.15	84.75
11.....	83.98	84.00	84.00	85.00	84.80	84.52	84.90	84.50	85.85	87.30	85.85	84.65
12.....	83.80	83.65	83.90	84.90	84.85	84.45	84.80	84.40	85.60	88.00	85.75	84.50
13.....	83.98	84.02	83.95	84.90	85.00	84.35	84.55	84.30	*a*	88.85	85.95	84.60
14.....	84.15	84.00	83.82	84.70	84.70	84.55	84.65	84.40	*a*	88.65	85.80	84.50
15.....	84.35	84.00	83.72	84.72	84.38	84.90	84.50	84.45	*a*	87.95	85.85	84.35
16.....	84.55	83.82	83.30	84.50	84.70	85.15	84.65	84.35	85.20	87.28	85.55	84.18
17.....	84.45	83.90	84.00	84.42	84.72	85.22	84.55	84.45	85.30	87.15	85.60	84.50
18.....	84.35	83.98	83.95	84.35	84.38	85.12	84.60	84.40	*a*	87.22	85.90	84.70
19.....	84.32	83.65	83.90	84.28	85.70	84.95	84.50	84.45	*a*	86.90	86.00	84.70
20.....	84.25	84.00	83.88	84.12	85.90	84.98	84.60	84.30		86.70	86.00	84.70
21.....	84.10	84.00	84.15	84.18	85.90	84.90	*a*	84.15	*a*	86.38	85.85	84.60
22.....	83.88	84.00	84.60	84.50	85.80	84.60	*a*	84.25	*a*	86.30	86.02	84.40
23.....	84.00	83.95	84.10	84.60	85.60	85.32	*a*	84.22	86.40	86.10	86.60	84.10
24.....	83.78	83.95	84.30	84.68	85.42	85.55	*a*	84.00	86.40	85.88	86.92	84.45
25.....	83.55	83.80	84.30	84.85	85.38	*a*	*a*	84.30	86.52	85.90	87.05	84.25
26.....	83.50	83.55	84.40	84.78	85.15	86.30	85.05	84.68	86.40	85.80	87.05	84.20
27.....	83.60	84.00	85.35	84.60	84.95	86.30	*a*	84.55	86.30	85.80	86.78	84.15
28.....	83.50	83.88	85.50	84.35	84.88	86.05	*a*	*a*	87.30	85.65	86.60	84.20
29.....	83.85	83.78	85.15	84.85	84.70	85.72	*a*	......	87.65	85.55	86.25	84.40
30.....	84.05	83.72	85.08	84.72	84.95	85.50	*a*	......	87.40	85.35	85.85	84.65
31.....	83.90	83.70	......	85.00	......	85.85	*a*	......	87.30	......	85.55	......

a No record.

HUDSON RIVER BELOW LOCK No. 4, STILLWATER

Gage No. 108

This station, established October 19, 1916, is located at the lower end of lock No. 4. The water-surface indicated is that of the upper end of the pool maintained by the dam of the West Virginia Pulp and Paper Company. The gage, No. 108, is a standard Type A gage in two sections. The lower section is secured to the nosing at the lower end of the west lock wall and has a range of 11½ feet, between elevations 65.0 and 76.5. The upper section is secured to the end of the west lower thrust wall of the lock and has a range of 8 feet, between elevations 76.5 and 84.5. Standard bench-mark plugs are set in the walls near the gages, for the lower section at elevation 76.0 (B. C. datum) and for the upper section at elevation 79.0 (B. C. datum).

The gage is read twice daily — at 8 A. M. and 3 P. M. — to half-tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER BELOW LOCK No. 4, STILLWATER, for the year ended June 30, 1919. John O. Fordham, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	70.00	69.65	69.95	71.45	72.62	71.85	71.60	*a*	*a*	72.20	70.25	70.40
2.....	70.05	68.85	70.65	71.10	72.92	71.50	72.45	71.35	71.95	71.90	70.50	69.70
3.....	69.95	69.90	70.30	71.05	73.00	71.25	72.40	70.25	71.05	71.45	70.50	69.45
4.....	69.25	68.60	70.38	70.45	72.60	71.10	72.20	70.35	70.75	71.60	71.05	69.15
5.....	70.50	69.25	70.05	70.80	72.42	71.18	72.15	70.42	70.70	71.45	71.10	68.85
6.....	70.00	70.50	70.12	71.35	72.15	71.25	71.76	70.00	71.00	71.90	71.40	68.70
7.....	69.50	69.90	70.00	69.90	71.85	70.90	72.00	70.10	71.10	71.70	71.30	67.85
8.....	68.35	69.70	70.38	71.90	71.75	71.25	71.75	70.15	70.75	72.10	71.10	68.70
9.....	70.14	69.25	68.05	72.05	71.45	69.75	71.58	70.45	71.55	72.15	70.95	67.50
10.....	70.18	70.12	69.70	71.65	71.85	71.15	72.15	69.45	72.15	72.20	71.10	70.65
11.....	69.98	70.58	70.10	71.35	71.40	70.75	71.78	70.40	71.85	72.45	71.35	70.25
12.....	69.02	68.60	69.85	71.15	71.45	70.45	71.82	70.00	71.55	73.85	70.65	69.70
13.....	68.70	70.30	70.25	71.60	71.30	70.30	72.05	69.25	*a*	74.40	71.35	70.00
14.....	70.55	70.32	69.90	70.80	70.95	70.55	71.78	69.95	*a*	73.90	70.75	69.35
15.....	70.65	70.10	70.08	70.90	70.10	71.85	71.50	70.30	*a*	72.95	70.75	70.10
16.....	70.75	69.60	68.85	70.48	70.85	72.20	71.50	70.50	71.30	72.38	70.40	67.65
17.....	70.40	69.72	70.30	70.20	71.40	72.05	70.95	69.75	71.05	72.35	70.45	70.35
18.....	70.20	69.75	69.95	70.05	70.50	71.90	71.00	69.75	*a*	72.42	71.70	70.40
19.....	70.40	67.55	69.98	70.10	72.45	71.40	71.05	69.90	*a*	72.05	71.25	70.30
20.....	70.25	69.58	69.95	70.00	72.75	71.40	70.85	69.40	*a*	72.12	71.05	70.35
21.....	70.85	69.50	70.45	69.70	72.70	71.40	*a*	69.15	*a*	71.95	70.75	70.10
22.....	69.70	70.00	71.45	70.50	72.50	71.80	*a*	70.00	*a*	71.30	71.35	70.35
23.....	69.65	69.90	70.00	70.52	72.20	72.10	*a*	70.10	72.52	71.00	72.00	68.10
24.....	69.90	70.05	70.45	70.68	72.42	72.45	*a*	68.75	72.30	70.80	72.05	67.30
25.....	69.45	68.88	70.28	70.75	72.00	*a*	*a*	70.00	72.25	70.68	72.45	70.22
26.....	68.80	67.88	70.45	70.75	71.72	73.20	72.10	70.40	72.20	70.45	72.15	70.05
27.....	68.80	68.95	72.65	71.50	71.40	73.10	*a*	70.30	71.90	70.70	71.75	69.90
28.....	68.10	69.42	72.25	69.75	71.10	72.70	*a*	*a*	73.25	70.50	71.70	69.90
29.....	69.80	70.28	72.35	71.05	70.95	72.85	*a*	......	73.25	70.20	71.15	70.65
30.....	70.15	69.70	71.75	70.70	71.40	71.95	*a*	......	73.30	70.80	70.55	70.55
31.....	69.70	69.95	......	71.25	......	71.30	*a*	......	72.55	......	70.35	......

a No record.

HUDSON RIVER ABOVE DAM No. 3, MECHANICVILLE

Gage No. 106

This station, established October 19, 1916, is located at the upper end of lock No. 3. The water-surface indicated is that above the dam of the West Virginia Pulp and Paper Company. The gage, No. 106, is a standard Type A gage in two sections. The lower section is secured to the nosing at the upper end of the east lock wall and has a range of 11½ feet, between elevations 65.5 and 77.0. The upper section is secured to the face of the old abutment at the upper end of the east lock wall and has a range of 8 feet, between elevations 77.0 and 85.0. Standard bench-mark plugs are set near the gages, for the lower section at elevation 76.0 (B. C. datum) and for the upper section at elevation 80.0 (B. C. datum).

The gage is read twice daily — at 7 A. M. and 3 P. M. — to hundredths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER ABOVE DAM No. 3, MECHANICVILLE, for the year ended June 30, 1919. Chas. A. Ehren, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	69.80	69.66	70.12	71.50	72.76	71.70	71.65	71.16	71.76	72.22	70.28	70.25
2	70.46	68.90	70.78	71.30	73.02	71.80	72.55	*a*	72.06	*a*	70.50	69.80
3	70.10	69.76	70.46	71.04	73.14	71.41	72.35	*a*	71.03	71.55	70.61	69.54
4	69.48	68.46	70.23	70.40	72.74	71.06	72.22	*a*	70.78	71.72	71.10	69.10
5	70.58	69.36	70.20	70.85	72.46	71.26	72.15	*a*	*a*	71.46	71.02	68.84
6	70.24	70.52	70.27	71.46	72.21	71.31	71.65	*a*	*a*	71.70	71.42	68.74
7	69.69	70.06	70.02	70.35	72.10	71.30	71.40	*a*	*a*	71.70	71.32	67.86
8	69.20	69.75	70.55	71.94	72.18	71.05	71.62	*a*	*a*	71.95	71.11	69.25
9	69.81	70.11	68.42	72.14	71.60	70.65	71.48	70.30	71.52	72.06	71.15	67.61
10	70.70	70.30	69.55	71.85	71.82	71.20	71.40	69.48	72.22	72.18	71.06	70.52
11	70.33	70.65	70.28	71.50	72.00	71.10	71.60	70.48	72.01	72.42	71.40	70.61
12	69.10	68.82	70.10	71.32	71.76	*a*	71.45	70.32	71.60	73.82	70.70	69.15
13	68.66	70.42	70.35	71.50	71.57	70.60	71.02	69.22	71.54	74.58	71.11	70.26
14	70.66	70.34	70.05	70.95	71.25	70.54	70.80	70.22	71.24	73.72	71.10	69.61
15	70.70	70.20	70.22	70.96	70.30	71.95	70.36	70.16	70.94	72.90	70.86	70.58
16	70.78	69.87	69.00	70.64	70.95	71.76	70.70	70.50	71.46	72.40	70.38	68.25
17	70.48	69.86	70.16	70.38	71.48	72.32	69.85	70.30	71.16	72.22	70.44	70.46
18	70.22	69.72	70.16	70.26	70.75	72.12	70.65	69.96	71.30	72.26	71.70	70.50
19	69.96	68.00	70.21	70.35	72.49	71.80	70.86	70.00	71.85	72.04	71.22	70.40
20	70.36	69.78	70.10	70.23	72.69	71.46	70.58	69.85	71.77	72.12	71.12	70.52
21	70.72	69.72	70.45	69.78	72.67	71.46	70.91	69.80	72.18	71.48	70.64	69.96
22	69.78	70.36	71.35	70.32	72.58	72.00	70.46	70.00	72.45	71.26	71.46	70.22
23	69.86	70.05	70.32	70.52	72.56	72.20	70.46	70.20	72.60	71.20	71.95	67.90
24	70.00	70.16	70.49	70.65	72.65	72.66	71.80	69.08	72.20	70.80	72.10	67.10
25	69.76	69.30	70.38	70.88	72.15	*a*	71.78	*a*	72.36	70.92	72.61	70.30
26	69.02	68.60	70.68	70.88	71.81	73.22	72.11	70.53	72.16	70.46	71.19	70.09
27	68.88	69.26	72.81	71.40	71.50	73.16	71.80	70.22	72.04	71.00	71.82	69.68
28	68.25	70.24	72.48	69.86	71.16	72.90	71.56	70.00	73.24	70.50	71.70	70.15
29	69.80	70.36	72.25	71.15	70.66	72.90	71.36	......	73.26	70.26	71.16	70.96
30	69.94	69.86	71.72	70.88	71.56	72.42	71.26	......	73.20	70.64	70.55	70.78
31	70.11	70.14	......	71.44	......	71.46	71.06	......	72.82	......	70.35	......

a No record.

HUDSON RIVER BELOW DAM No. 3, MECHANICVILLE

Gage No. 105

This station, established October 19, 1916, is located at the lower end of lock No. 3. The water-surface indicated is that below the dam of the West Virginia Pulp and Paper Company and at the upper end of the pool above the dam of the Adirondack Electric Power Corporation. The gage, No. 105, is a standard Type A gage in two sections. The lower section is secured to the nosing at the lower end of the east wall of the lock and has a range of 10½ feet, between elevations 46.0 and 56.5. The upper section is secured to the lower end of the east thrust wall of the lock and has a range of 12 feet, between elevations 56.5 and 68.5. Standard bench-mark plugs are set in the walls near the gages, for the lower section at elevation 52.0 (B. C. datum) and for the upper section at elevation 59.0 (B. C. datum).

The gage is read twice daily — at 7 A. M. and 3 P. M. — to hundredths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER BELOW DAM No. 3, MECHANICVILLE, for the year ended June 30, 1919. Chas. A. Ehren, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	48.52	47.98	47.95	49.42	50.32	49.18	49.90	49.32	50.20	52.26	50.24	50.05
2......	48.36	47.98	47.92	49.26	50.62	49.32	50.85	*a*	50.58	*a*	50.55	50.02
3......	48.25	47.98	48.20	49.08	50.34	49.15	50.70	*a*	50.02	51.33	50.71	49.54
4......	47.95	47.90	48.09	48.55	50.18	48.67	50.56	*a*	49.64	51.36	50.80	49.15
5......	48.10	48.02	48.12	48.68	49.78	49.00	50.00	*a*	*a*	51.24	51.02	49.00
6......	48.02	47.98	48.08	48.58	49.72	48.98	49.99	*a*	*a*	51.10	51.70	48.85
7......	47.87	48.14	48.10	48.16	49.38	48.86	49.40	*a*	*a*	51.45	51.65	48.32
8......	48.39	47.80	48.02	49.80	48.85	48.30	49.72	*a*	*a*	51.76	51.42	48.00
9......	48.20	48.10	47.94	50.16	48.96	48.05	49.62	48.25	50.05	52.04	51.25	47.88
10......	48.35	48.11	48.05	49.80	48.86	48.70	49.36	49.05	51.06	52.25	51.38	48.78
11......	48.10	48.05	48.05	49.30	48.50	49.35	49.45	49.11	50.80	52.46	51.30	48.54
12......	48.16	48.01	48.08	49.10	48.91	*a*	48.50	48.58	50.50	54.52	51.02	48.44
13......	47.95	47.98	48.06	48.82	49.21	48.50	49.04	48.34	50.41	55.14	51.34	48.40
14......	48.09	48.00	48.00	48.44	48.82	48.50	49.08	48.30	50.17	54.62	51.35	48.25
15......	48.21	47.95	48.05	48.63	48.26	48.95	49.78	48.40	50.02	53.55	51.03	48.03
16......	48.48	48.04	47.90	48.40	48.54	50.00	49.08	48.50	49.88	52.70	50.48	48.14
17......	48.35	47.95	48.10	48.34	48.35	50.09	48.65	48.50	50.15	52.56	50.50	48.26
18......	48.28	47.97	47.94	48.32	48.36	49.92	48.86	48.44	50.44	52.56	51.32	48.46
19......	48.02	48.27	48.06	48.32	50.50	49.74	48.51	48.40	51.12	52.26	51.54	48.50
20......	48.25	48.02	48.04	48.20	50.82	49.26	48.71	48.20	51.04	52.28	51.50	48.64
21......	47.96	48.03	48.16	48.30	50.80	49.26	48.75	48.06	51.51	51.32	51.06	48.42
22......	47.98	48.06	48.65	48.34	50.43	49.60	48.52	48.35	51.70	51.00	51.66	48.25
23......	48.09	48.06	48.10	48.40	50.10	50.02	48.62	47.93	51.40	50.81	52.35	48.14
24......	48.02	48.12	48.22	48.50	49.41	50.60	49.85	48.01	51.62	50.68	52.50	48.08
25......	48.06	48.04	48.09	48.96	49.43	*a*	50.20	*a*	51.70	50.94	52.70	48.20
26......	48.04	47.94	48.32	48.78	49.28	50.76	49.85	48.76	51.50	50.50	52.52	48.01
27......	48.06	47.94	51.09	48.18	49.42	51.66	49.86	48.86	51.17	50.76	52.00	47.96
28......	48.00	48.00	50.48	48.20	49.25	51.41	49.66	48.48	53.10	50.52	51.91	48.12
29......	48.10	48.08	49.85	49.00	49.02	50.90	49.50	......	53.66	50.22	51.26	48.10
30......	48.05	47.94	49.76	48.72	49.42	50.40	49.44	......	53.15	50.60	50.64	48.20
31......	48.02	47.90	......	48.78	......	50.36	49.11	......	52.88	......	51.26	......

a No record.

HUDSON RIVER AT MECHANICVILLE

Location.—At Duncan dam of West Virginia Pulp & Paper Co., in Mechanicville, Saratoga county, 3,700 feet above mouth of Anthony kill, 1¼ miles below mouth of Hoosic river and about 19 miles above mouth of Mohawk river.

Drainage area.— 4,500 square miles.

Records available.— 1888 to June 30, 1919.

Gage.— Water-stage recorder at the dam installed in 1910; previous to that date, staff gage.

Computations of discharge.— Discharge over spillway determined from a rating curve based on coefficients derived by United States Geological Survey for dams of ogee section. Discharge through turbines computed from records of their operation. Discharge at lock and through Barge canal turbines at lock computed from records of the number of lockages per day.

Extremes of discharge.— Current year: Maximum daily discharge, 31,600 second-feet, April 13. Minimum daily discharge, 587 second-feet, August 4.

1888–1919: Maximum discharge recorded, 120,000 second-feet at 6 A. M., March 28, 1913.* The plant is occasionally shut down and the flow of the river stored in the pond, so that the discharge below the station occasionally becomes practically zero.

Diversions.— Water is diverted from Hudson river through the Glens Falls feeder and the old Champlain canal into the summit level of the Barge canal. A portion flows north into Lake Champlain. No correction has been made for this diversion.

Coöperation.— Record of discharge over the spillway and through turbines of the West Virginia Pulp & Paper Co. furnished by W. J. Barnes, engineer of the company.

* Highest known flood prior to this time occurred April, 1869. Calculated discharge, 70,000 second-feet. See Water-Supply Paper 65, page 51, and report of United States Board of Engineers on Deep Waterways, part 1, pages 377-388.

Daily discharge, in second-feet, of HUDSON RIVER AT WEST VIRGINIA PULP AND PAPER CO.'S MILL (UPPER DAM), MECHANICVILLE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	2,330	1,640	631	6,410	14,400	6,830	8,690	5,000	10,400	14,700	9,340	6,900
2......	2,650	1,350	1,050	5,660	14,800	6,800	13,400	3,580	7,190	12,500	9,990	8,480
3......	2,460	1,740	2,600	4,460	13,300	5,440	11,400	4,770	6,490	11,400	10,100	7,180
4......	1,460	587	2,520	4,920	13,100	5,340	10,400	4,450	5,820	11,500	10,300	6,090
5......	3,020	1,220	2,140	4,000	11,600	6,070	7,760	4,210	8,270	11,000	14,400	5,390
6......	2,290	1,670	2,170	3,260	10,300	5,280	6,960	3,670	7,660	10,600	13,400	4,990
7......	1,430	1,650	1,790	4,780	8,460	4,660	6,600	3,980	7,240	12,700	14,400	4,000
8......	1,990	1,520	1,190	9,190	7,660	4,190	6,680	3,710	6,490	14,100	11,700	3,070
9......	2,990	1,410	1,120	8,900	6,890	3,390	6,520	2,280	8,800	14,700	13,700	4,020
10......	2,580	1,420	1,740	7,460	6,280	4,890	6,220	3,150	12,400	14,900	11,800	5,200
11......	2,090	1,160	2,140	6,480	5,870	4,340	5,340	3,760	10,400	17,300	11,800	4,620
12......	1,820	1,200	1,890	5,490	6,380	4,080	4,140	3,300	9,010	27,300	11,300	4,170
13......	2,250	2,040	2,040	4,940	6,190	4,270	4,880	2,890	7,760	31,600	12,200	3,930
14......	1,710	2,010	1,580	4,920	4,380	4,610	4,960	3,040	6,460	29,400	10,800	3,320
15......	3,930	1,940	1,030	4,970	3,770	8,420	4,560	3,480	6,860	23,300	11,000	2,340
16......	4,140	1,710	1,360	4,200	4,620	11,400	4,680	2,160	5,980	20,300	9,840	2,920
17......	3,640	1,680	2,180	3,780	3,520	9,750	4,380	3,280	7,250	20,400	10,700	3,760
18......	3,790	988	2,090	3,480	8,320	7,950	4,730	3,540	9,040	20,200	13,800	4,940
19......	3,400	1,190	1,780	3,100	12,200	7,170	3,730	3,380	10,700	17,300	13,800	4,500
20......	3,120	1,670	1,780	1,520	13,400	6,740	4,960	2,790	10,900	15,900	12,500	4,200
21......	1,830	1,670	3,360	3,360	13,100	6,250	4,340	2,510	13,000	13,900	11,600	3,870
22......	2,240	1,650	3,290	4,240	12,200	7,240	4,010	2,800	14,300	13,400	16,600	2,260
23......	2,160	1,630	2,700	4,730	10,800	11,900	4,790	1,840	13,000	11,300	18,600	2,980
24......	1,770	1,600	3,120	5,090	9,860	13,100	8,510	2,590	13,500	11,100	19,300	2,520
25......	1,350	788	2,690	4,760	9,570	17,400	7,790	3,300	13,700	10,600	19,600	2,430
26......	1,260	1,040	5,230	5,090	7,800	16,700	7,790	4,690	12,400	10,100	19,000	2,320
27......	1,230	1,300	12,100	4,960	6,910	15,700	8,010	4,010	12,300	11,100	17,200	2,400
28......	810	1,470	9,740	4,280	4,880	13,500	7,000	3,920	26,000	9,560	15,600	2,260
29......	1,720	1,520	8,970	5,030	6,660	11,400	6,510	......	21,500	9,150	13,500	2,800
30......	2,170	1,630	7,800	4,790	6,720	9,600	6,140	......	18,500	9,500	10,300	4,440
31......	1,920	1,460	......	5,010	......	8,620	5,900	......	16,500	......	9,550	......
Mean...	2,310	1,470	3,130	4,940	8,800	8,160	6,510	3,430	11,000	15,400	13,200	4,080

Monthly discharge of HUDSON RIVER AT WEST VIRGINIA PULP AND PAPER CO.'S MILL (UPPER DAM), MECHANICVILLE, for the year ended June 30, 1919

[Drainage area, 4,500 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	4,140	810	2,310	0.513	0.59
August	2,040	587	1,470	0.327	0.38
September	12,100	631	3,130	0.696	0.78
October	9,190	1,520	4,940	1.10	1.27
November	14,800	3,520	8,800	1.96	2.19
December	17,400	3,390	8,160	1.81	2.09
January	13,400	3,730	6,510	1.45	1.67
February	5,000	1,840	3,430	0.762	0.79
March	26,000	5,820	11,000	2.44	2.81
April	31,600	9,150	15,400	3.42	3.82
May	19,600	9,340	13,200	2.93	3.38
June	8,480	2,260	4,080	0.907	1.01
The year	31,600	587	6,869	1.53	20.78

HUDSON RIVER AT TOLL BRIDGE, MECHANICVILLE

Gage No. 9

This station, established August 16, 1905, is located at the highway bridge crossing the Hudson river at Mechanicville, commonly known as Toll bridge, about 2 miles above the lower dam and about ¾ mile below the upper dam. The gage is a standard chain gage located on the upstream side of the first span from the west end of the bridge. Readings are taken twice daily — at 8 A. M. and 5:30 P. M.— to half-tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER AT TOLL BRIDGE' MECHANICVILLE, for the year ended June 30, 1919. Byron Stedman, Observer

DAY	July	Aug.	DAY	July	Aug.	DAY	July	Aug.
1	48.32	48.20	11	48.20	48.28	21	48.10	......
2	48.35	48.15	12	48.15	48.15	22	48.10	......
3	48.18	48.10	13	48.30	48.30	23	48.32	......
4	48.18	47.85	14	48.05	48.22	24	48.30	......
5	48.55	48.10	15	48.42	48.10	25	48.20	......
6	48.35	48.20	16	48.60	.....	26	48.15	......
7	47.90	48.10	17	48.48	.....	27	48.10	......
8	48.20	48.25	18	48.40	.....	28	48.20	......
9	48.15	48.15	19	48.30	.....	29	48.20	......
10	48.40	48.15	20	48.30	.....	30	48.20	......
						31	48.25	......

NOTE.— Station discontinued August 15, 1918.

HUDSON RIVER ABOVE DAM No. 2, MECHANICVILLE

Gage No. 104

This station, established October 19, 1916, is located at the upper end of lock No. 2, and is practically a continuation of the station, "Hudson River above Dam of Adirondack Electric Power Corporation." The gage, No. 104, is a standard Type A gage secured to the splay wall at the upper end of the lock and has a range of 12 feet, between elevation 44.0 and 56.0. A standard bench-mark plug is set in the wall near the gage at elevation 52.0 (B. C. datum).

The gage is read twice daily — 8 A. M. and 3 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER ABOVE DAM No. 2, MECHANICVILLE, for the year ended June 30, 1919. Wm. H. Gaillard, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	47.95	47.85	47.8	48.95	49.55	48.45	49.15	48.75	49.3	50.9	49.75	49.6
2......	47.95	47.85	47.78	48.68	49.6	48.85	*a*	48.95	*a*	*a*	49.85	49.3
3......	47.8	47.85	47.9	48.45	49.2	48.55	*a*	48.35	*a*	50.2	49.95	49.1
4......	47.8	47.6	47.95	47.95	49.2	48.3	*a*	48.05	*a*	50.15	50.3	48.75
5......	47.8	47.8	47.85	48.2	48.85	48.5	49.5	48.15	*a*	50.05	50.4	48.6
6......	47.8	47.65	47.85	48.05	49.0	48.5	*a*	48.05	*a*	50.1	50.65	48.3
7......	47.7	47.9	47.85	47.9	48.4	48.4	*a*	48.15	*a*	50.3	50.6	48.0
8......	47.75	47.9	47.95	49.2	48.4	47.7	*a*	48.10	*a*	50.55	50.55	47.65
9......	47.8	47.85	47.82	49.5	48.3	47.7	*a*	47.85	*a*	50.75	50.35	48.0
10......	47.95	47.95	47.88	49.2	48.05	48.6	*a*	*a*	*a*	50.8	50.6	48.4
11......	47.95	48.0	47.95	48.9	48.2	47.9	*a*	*a*	*a*	50.95	50.55	48.2
12......	47.7	47.85	47.90	48.55	48.55	*a*	*a*	*a*	*a*	52.35	50.2	48.05
13......	47.8	47.95	47.90	48.05	48.6	47.8	*a*	*a*	*a*	52.95	50.45	47.9
14......	48.0	47.8	47.85	48.0	48.25	47.95	*a*	*a*	*a*	52.65	50.2	47.9
15......	48.0	47.8	47.85	48.0	47.8	48.5	*a*	*a*	*a*	51.9	50.15	47.8
16......	48.2	47.85	47.68	47.9	48.05	49.55	*a*	47.65	*a*	51.25	49.95	47.9
17......	47.85	47.9	47.95	47.95	47.9	49.2	*a*	*a*	49.5	51.15	49.75	47.95
18......	47.85	47.75	47.85	47.9	47.85	49.25	*a*	*a*	49.65	51.2	50.7	48.1
19......	47.9	47.9	47.88	47.95	49.85	48.8	48.2	*a*	50.3	50.95	50.7	48.0
20......	47.95	47.9	47.9	47.9	49.95	48.75	48.4	*a*	50.2	50.75	50.55	48.25
21......	47.8	47.85	47.95	47.9	49.95	48.7	48.3	*a*	50.6	50.25	50.15	47.95
22......	47.85	47.75	48.15	47.95	49.35	48.2	*a*	*a*	50.7	50.1	50.6	48.15
23......	47.85	47.85	47.92	48.0	48.85	49.4	*a*	47.75	50.5	49.8	51.05	47.9
24......	47.85	47.8	47.95	48.1	48.45	49.85	*a*	47.9	50.5	50.0	51.1	47.9
25......	47.85	47.8	47.80	48.35	48.6	50.8	*a*	47.95	50.7	50.1	51.4	47.75
26......	47.9	47.75	48.05	48.3	48.4	50.75	49.4	48.30	*a*	49.75	51.35	47.75
27......	47.8	47.8	50.15	47.8	48.9	50.7	*a*	49.0	*a*	50.1	50.75	47.8
28......	47.8	47.95	49.5	47.85	48.55	50.4	*a*	48.15	*a*	49.85	50.6	47.8
29......	47.8	47.9	49.15	48.5	48.3	50.15	48.9	......	*a*	49.7	50.15	47.95
30......	47.85	47.85	49.2	48.15	48.85	49.85	48.8	......	51.6	50.0	49.85	48.35
31......	47.95	47.75	......	48.6	......	49.5	48.65	......	51.3	......	49.75	......

a No record.

HUDSON RIVER BELOW DAM No. 2, MECHANICVILLE

Gage No. 103

This station, established September 1, 1917, is located at the lower end of lock No. 2, and is practically a continuation of the station, "Hudson River below Dam of Adirondack Electric Power Corporation." The gage, No. 103, is a chain gage secured to the downstream side of the bridge across the lower end of lock No. 2. This gage gives elevations direct and has a range of 23 feet, between elevations 21.5 and 44.5.

The gage is read twice daily — 8 A. M. and 3 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER BELOW LOWER DAM, No. 2, MECHANICVILLE, for the year ended June 30, 1919. Wm. H. Gaillard, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	30.5	30.15	30.05	31.9	32.8	31.4	27.95	26.95	27.9	32.25	32.35	32.2
2	30.8	30.25	30.0	31.7	32.2	31.65	*a*	25.65	*a*	*a*	32.7	32.15
3	30.3	30.15	30.35	31.45	30.7	31.5	*a*	26.45	*a*	31.15	32.9	32.0
4	30.2	30.15	30.4	31.1	31.15	31.25	*a*	26.05	*a*	31.15	32.75	31.65
5	30.6	30.1	30.3	31.3	30.65	31.5	27.8	25.65	*a*	30.85	33.15	31.5
6	30.5	30.0	30.4	31.25	32.55	31.5	*a*	25.35	*a*	31.1	33.75	31.3
7	30.25	30.4	30.35	30.8	30.6	31.4	*a*	25.25	*a*	31.25	33.6	31.1
8	30.5	30.1	30.2	31.9	30.6	30.7	*a*	25.6	*a*	31.9	33.45	30.85
9	30.6	30.25	30.2	32.6	30.5	30.6	*a*	24.2	*a*	32.05	33.25	30.95
10	30.65	30.2	30.1	32.15	30.9	31.4	*a*	*a*	*a*	32.45	33.5	31.45
11	30.55	30.15	30.3	31.75	31.4	29.9	*a*	*a*	*a*	32.65	33.05	31.25
12	30.45	30.1	30.4	31.5	31.6	*a*	*a*	*a*	*a*	35.05	32.9	31.15
13	30.35	30.2	30.4	31.55	31.6	24.95	*a*	*a*	*a*	35.25	33.35	31.0
14	30.5	30.3	30.15	31.25	31.35	25.65	*a*	*a*	*a*	35.1	33.1	30.8
15	30.85	30.25	30.15	31.15	30.75	26.75	*a*	*a*	*a*	33.9	33.0	30.75
16	31.2	30.3	30.1	31.1	31.2	28.85	*a*	23.95	*a*	32.75	32.9	30.8
17	31.0	30.15	30.4	31.15	31.1	28.6	*a*	*a*	28.55	32.85	32.75	30.65
18	30.7	30.15	30.35	30.85	30.95	28.05	*a*	*a*	29.00	33.25	33.55	31.1
19	30.65	30.15	30.35	30.65	32.95	27.5	25.6	*a*	30.65	33.2	33.6	31.2
20	30.8	30.1	30.15	30.6	33.05	27.05	26.5	*a*	30.2	32.3	33.6	31.15
21	30.65	30.3	30.5	30.6	33.0	27.0	26.2	*a*	31.45	32.0	33.2	30.9
22	30.45	30.3	31.05	30.9	32.1	26.5	*a*	*a*	31.8	31.4	33.7	30.6
23	30.6	30.2	30.5	31.1	31.0	28.5	*a*	23.65	32.0	31.35	34.45	30.5
24	30.3	30.2	30.5	31.1	30.9	29.8	*a*	24.1	32.05	31.85	34.7	30.55
25	30.3	30.15	30.6	31.3	30.75	30.95	*a*	24.65	32.15	31.9	34.75	30.5
26	30.2	30.05	30.95	31.35	30.55	31.15	25.8	25.95	*a*	31.5	34.8	30.5
27	30.2	29.95	33.1	31.05	31.8	31.25	*a*	25.8	*a*	31.5	34.5	30.5
28	30.1	30.05	32.9	31.0	31.55	30.5	*a*	25.25	*a*	31.8	34.35	30.45
29	30.1	30.1	32.15	31.5	31.25	29.6	27.3	......	*a*	32.45	33.65	30.5
30	30.4	30.1	32.00	31.25	31.75	29.1	27.0	......	33.25	32.7	33.0	31.05
31	30.45	30.05	......	31.6	......	28.2	26.8	......	33.00	......	32.85	......

a No record.

HUDSON RIVER AT DAM OF ADIRONDACK ELECTRIC POWER CORPORATION (LOWER DAM), MECHANICVILLE

Location.— At the dam of the Adirondack Electric Power Corporation across the Hudson river, which is also known as dam No. 2, or lower Mechanicville dam. It is about 2½ miles below the West Virginia Pulp and Paper Company's dam, which is also known as dam No. 3, or upper Mechanicville dam.

Drainage area.— 4,570 square miles.

Records available.— Water-surface elevations, August 18, 1905, to June 30, 1919. Discharge, October 1, 1897, to June 30, 1919. Water-surface elevations given by gage above dam No. 2, Mechanicville.

Gages.— The gage above the dam is a vertical staff attached to a crib upstream from the power-house. Lower gage is a reference point on the hand-rail of downstream truss of highway bridge to Barge canal lock about 150 yards below power-house. This gage indicates elevation in tail-race.

Discharge computations.— Discharge is determined by the flow over the crest of the dam and the water passed through the wheels of the power company.

Extremes of discharge.— Current year: Maximum daily mean recorded, April 13, as 38,000 second-feet. Minimum daily mean recorded, August 26 and September 1, as 1,300 second-feet.

1897–1919: Maximum water-surface above dam recorded, elevation 58.5 on March 28, 1913, at 8 A. M.; discharge estimated by Department of State Engineer as about 94,000 second-feet. Minimum daily mean recorded, on August 29, 1909, as 24 second-feet.

Coöperation.— Records of flow over the dam and through the wheels are computed and furnished by the Adirondack Electric Power Corporation through Mr. George E. Fifield, Local Superintendent, to which are added estimated amounts of water used for canal purposes.

Daily discharge, in second-feet, of HUDSON RIVER AT DAM OF ADIRONDACK ELECTRIC POWER CORPORATION (LOWER DAM), MECHANICVILLE, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	3,030	2,390	1,300	7,480	13,500	6,590	9,330	5,450	10,400	23,300	10,400	8,740
2	3,580	2,380	1,360	6,520	15,800	7,180	13,200	4,530	12,900	20,300	11,300	9,090
3	3,240	1,930	2,730	6,490	14,200	6,950	12,900	5,640	10,500	19,000	12,000	8,330
4	2,010	1,370	3,430	5,460	14,300	5,990	11,200	5,760	8,940	18,900	11,600	6,890
5	3,810	1,690	2,630	5,550	13,000	6,420	9,230	5,030	8,940	18,100	14,700	6,270
6	3,160	2,160	2,780	5,150	12,200	6,070	9,100	5,000	9,960	18,100	16,700	5,380
7	2,400	2,160	2,390	4,190	9,470	5,420	7,890	4,810	9,930	19,700	16,100	5,140
8	2,680	1,900	1,740	8,390	8,240	4,120	8,000	4,770	9,310	21,900	14,500	3,820
9	3,080	2,180	1,520	9,960	8,130	3,380	7,700	3,210	9,350	22,700	14,200	4,190
10	3,680	2,010	1,840	8,460	6,890	5,430	7,190	3,130	16,600	23,300	14,900	5,920
11	2,930	1,760	2,460	6,980	5,840	5,160	6,840	4,800	15,300	24,400	12,800	5,890
12	2,800	1,530	2,310	6,260	6,380	4,610	5,200	4,350	13,700	34,700	12,700	5,150
13	2,540	2,310	2,510	5,560	6,880	4,570	6,190	3,940	12,600	38,000	14,800	4,930
14	2,680	2,720	1,710	5,640	5,900	5,220	6,490	4,090	10,800	36,900	13,400	3,920
15	3,880	2,680	1,700	5,720	4,040	7,030	5,320	4,280	9,430	31,600	12,900	4,070
16	5,280	2,160	1,550	5,130	4,980	10,800	5,920	2,860	8,480	26,100	11,600	3,660
17	4,640	1,980	2,560	4,350	4,640	10,200	5,620	4,040	9,990	25,500	11,800	4,480
18	4,330	1,570	2,600	3,910	5,520	9,360	5,930	4,060	10,900	25,600	15,800	5,410
19	4,040	1,310	2,220	3,560	12,100	7,890	4,060	4,260	13,800	22,800	15,700	5,590
20	3,700	1,830	1,990	2,440	13,400	7,430	5,620	3,960	13,800	20,700	14,900	5,640
21	2,720	2,210	2,990	3,440	13,900	6,800	6,000	3,650	16,000	19,100	13,600	4,950
22	2,630	1,800	4,740	4,700	13,900	6,210	5,170	3,690	17,400	17,800	16,700	3,410
23	3,070	1,770	3,170	5,240	13,500	10,000	5,660	3,050	18,200	16,500	21,400	3,720
24	2,260	1,830	3,740	5,520	10,600	12,500	8,900	3,040	19,300	13,500	23,400	3,600
25	1,970	1,870	3,650	5,750	10,900	16,800	9,520	4,180	18,800	13,000	23,400	3,780
26	1,630	1,300	4,280	5,820	9,400	17,000	8,960	5,560	18,100	12,100	24,500	3,410
27	1,720	1,810	12,800	5,370	7,870	16,600	9,520	5,640	16,800	12,100	21,400	3,310
28	1,490	1,950	11,400	4,860	6,500	14,200	8,650	5,040	28,500	12,100	20,100	3,000
29	2,175	1,950	9,160	5,550	6,210	11,700	8,130	......	29,800	10,400	16,400	3,630
30	2,970	1,940	8,590	5,460	7,780	9,120	7,800	......	26,600	10,900	12,200	5,630
31	2,700	1,810	......	6,600	......	7,990	7,360	......	26,500	......	10,700	......
Mean	2,994	1,944	3,595	5,662	9,532	8,346	7,697	4,351	14,891	20,970	15,374	5,032

Monthly discharge, in second-feet, of HUDSON RIVER AT DAM OF ADIRONDACK ELECTRIC POWER CORPORATION (LOWER DAM), MECHANICVILLE, for the year ended June 30, 1919

[Drainage area, 4,570 square miles]

Month	Discharge in second-feet: Maximum	Minimum	Mean	Per square mile	Run-off: Depth in inches on drainage area
July	5,280	1,490	2,994	0.655	0.76
August	2,720	1,300	1,944	0.425	0.49
September	12,800	1,300	3,595	0.787	0.88
October	9,960	2,440	5,662	1.239	1.43
November	15,800	4,040	9,532	2.086	2.33
December	17,000	3,380	8,346	1.826	2.11
January	13,200	4,060	7,697	1.684	1.94
February	5,760	2,860	4,351	0.952	0.99
March	29,800	8,480	14,891	3.258	3.76
April	38,000	10,400	20,970	4.589	5.12
May	24,500	10,400	15,374	3.364	3.88
June	9,090	3,000	5,032	1.101	1.23
The year	38,000	1,300	8,366	1.830	24.92

HUDSON RIVER ABOVE DAM No. 1, NEAR WATERFORD

Gage No. 102

This station, established October 19, 1916, is located at the upper end of lock No. 1. The gage, No. 102, is a standard Type A gage secured to the upper end of the east upper gate recess and has a range of 20 feet, between elevations 19.0 and 39.0. A standard bench-mark plug is set in the wall near the gage at elevation 38.0 (B. C. datum).

The gage is read twice daily — at 7 A. M. and 3 P. M.— to half-tenths and even hundredths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER ABOVE DAM No. 1, NEAR WATERFORD, for the year ended June 30, 1919. H. W. Steventon, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	30.64	30.40	30.36	31.81	32.51	31.51	20.80	20.04	*a*	26.88	32.28	32.16
2.....	30.85	30.42	30.14	31.59	31.14	31.61	21.78	19.77	23.84	25.58	32.36	32.05
3.....	30.68	30.38	30.52	31.52	29.36	31.54	22.03	19.98	*a*	25.00	32.60	31.90
4.....	30.38	30.15	30.74	31.28	29.98	31.28	21.60	19.60	*a*	24.97	32.56	31.70
5.....	30.61	30.28	30.52	31.31	29.32	31.44	20.51	19.68	*a*	24.75	32.79	31.54
6.....	30.56	30.32	30.66	31.29	32.28	31.43	20.35	19.36	*a*	24.69	33.26	31.36
7.....	30.40	30.48	30.54	31.04	29.48	31.31	20.30	19.24	*a*	26.24	33.00	31.23
8.....	30.55	30.29	30.35	31.89	29.82	31.11	20.35	19.29	*a*	27.98	32.96	31.05
9.....	30.70	30.42	30.25	32.22	30.24	31.02	20.25	18.75	20.62	28.30	32.87	30.94
10.....	30.60	30.38	30.22	32.02	30.82	31.26	20.88	*a*	*a*	28.78	33.03	31.41
11.....	30.65	30.40	30.54	31.70	30.96	25.75	20.80	*a*	*a*	29.10	32.71	31.36
12.....	30.55	30.30	30.55	31.56	31.54	19.21	20.45	*a*	20.83	31.20	32.66	31.15
13.....	30.40	30.46	30.53	31.37	31.69	19.21	20.39	*a*	21.66	31.18	32.90	31.12
14.....	30.68	30.49	30.44	31.36	31.42	19.36	20.01	*a*	21.42	30.84	32.72	31.06
15.....	30.92	30.58	30.31	31.33	30.98	20.08	19.94	*a*	20.69	29.40	32.67	30.86
16.....	31.25	30.46	30.33	31.23	31.22	21.48	19.74	18.76	20.50	27.64	32.42	30.83
17.....	31.12	30.45	30.57	31.11	31.22	21.05	19.51	*a*	21.67	28.50	32.39	31.02
18.....	30.98	30.35	30.50	31.06	31.11	20.77	19.64	*a*	25.10	30.63	33.10	31.28
19.....	31.02	30.28	30.48	30.90	32.56	20.45	19.62	*a*	28.38	31.10	33.05	31.22
20.....	30.85	30.30	30.34	30.51	32.69	20.12	19.78	*a*	28.12	30.28	33.02	31.19
21.....	30.70	30.42	30.72	30.77	32.67	20.02	19.64	*a*	29.30	30.05	32.76	31.10
22.....	30.48	30.50	31.20	31.16	32.61	19.92	19.25	*a*	30.06	29.46	33.02	30.88
23.....	30.62	30.48	30.76	31.21	30.05	20.93	19.40	18.66	30.16	30.15	33.66	30.80
24.....	30.38	30.40	30.89	31.23	30.46	21.88	20.95	*a*	30.34	30.98	33.85	30.80
25.....	30.40	30.28	30.86	31.36	30.08	22.44	20.98	*a*	30.30	31.06	33.88	30.79
26.....	30.25	30.10	30.98	31.30	30.05	23.48	20.14	*a*	29.96	30.78	33.98	30.69
27.....	30.30	30.30	32.78	31.26	31.69	22.71	20.76	*a*	29.40	30.86	33.62	30.62
28.....	30.34	30.38	32.43	31.12	31.54	22.61	20.50	*a*	31.32	31.64	33.50	30.62
29.....	30.22	30.40	32.05	31.46	31.26	21.96	20.22	......	29.58	32.31	33.06	31.06
30.....	30.56	30.39	32.01	31.27	31.71	21.26	20.24	......	28.44	32.45	32.66	31.32
31.....	30.60	30.44	......	31.54	......	20.54	20.11	......	27.90	......	32.46	......

a No record.

NOTE.— A record of Taintor gate openings is shown in the table on the following page.

Gate openings of the six Taintor-gates in DAM No. 1, NEAR WATERFORD, for the year ended June 30, 1919

From		To		Number of gates open.	Time open
Day	Hour	Day	Hour		
July 1	....	Oct. 19	....	0	....
Oct. 20	....	Oct. 26	....	6	(Lowered)
Oct. 27	....	Nov. 2	9 A. M.	0	....
Nov. 2	9 A. M.	Nov. 5	7 P. M.	2	....
Nov. 5	7 P. M.	Nov. 6	6 P. M.	1	....
Nov. 6	6 P. M.	Nov. 10	10 A. M.	1	....
Nov. 10	10 A. M.	Nov. 21	4:30 P. M.	0	....
Nov. 21	4:30 P. M.	Nov. 25	12 P. M.	1	....
Nov. 22*	....	....	....	1	8 hours
Nov. 23*	....	....	....	1	12½ hours
Nov. 25*	....	....	....	1	13½ hours
Nov. 26	....	....	....	2	9½ hours
Nov. 27	....	Dec. 10	....	0	....
Dec. 11	....	....	....	5	....
Dec. 12	....	Mar. 16	....	6	....
Mar. 17	....	....	....	3	24 hours
Mar. 17*	....	....	....	3	15 hours
Mar. 18	....	Mar. 28	12 P. M.	2	....
Mar. 18*	....	....	....	1	9 hours
Mar. 28*	3 P. M.	Mar. 28	12 P. M.	2	....
Mar. 29	0 A. M.	April 6	12 P. M.	4	....
April 7	0 A. M.	April 12	12 P. M.	3	....
April 7*	0 A. M.	April 7	9 A. M.	1	....
April 12*	....	....	....	1	10 hours
April 13	0 A. M.	April 16	12 P. M.	4	....
April 17	....	....	....	1	9 hours
April 17	....	....	....	3	24 hours
April 18	0 A. M.	April 22	12 P. M.	2	....
April 18*	....	....	....	1	12 hours
April 27	0 A. M.	April 27	12 P. M.	1	....
April 23*	....	....	....	1	12 hours
April 28	....	....	....	1	9 hours
April 29	....	June 30	....	0	....

* Additional short-time openings.

HUDSON RIVER BELOW DAM No. 1, NEAR WATERFORD

Gage No. 101

This station, established October 19, 1916, is located at the lower end of lock No. 1. The water-surface indicated is at the upper end of the pool maintained by the new Federal dam at Troy. The gage, No. 101, is a standard Type A gage in two sections. The lower section is secured to the north end of the west lower approach wall and has a range of 13 feet, between elevations 12.0 and 25.0. The upper section is secured to the lower end of the lower west thrust wall and has a range of 11 feet, between elevations 25.0 and 36.0. Standard bench-mark plugs are set in the walls adjacent to the gages, the one for the lower section being at elevation 24.0 (B. C. datum) and the one for the upper section being at elevation 27.0 (B. C. datum).

The gage is read twice daily — at 7 A. M. and 3 P. M.— to half-tenths and even hundredths.

Daily elevation of water-surface (B. C. datum) of HUDSON RIVER BELOW DAM No. 1, NEAR WATERFORD, for the year ended June 30, 1919. H. W. Steventon, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	17.20	16.82	17.12	18.44	20.28	18.34	19.29	18.45	*a*	20.51	18.95	18.56
2	17.92	16.74	16.65	18.31	20.06	18.31	19.65	18.29	19.85	20.26	19.18	18.44
3	17.38	16.60	16.84	18.08	19.62	18.19	20.21	18.28	*a*	20.21	19.64	18.44
4	17.12	16.71	17.12	18.01	19.50	18.06	19.66	18.00	*a*	20.22	19.3	18.15
5	17.02	16.60	16.94	17.87	19.15	18.26	18.88	17.94	*a*	20.33	19.66	18.08
6	17.25	16.65	17.00	18.28	19.00	18.38	18.80	17.86	*a*	20.45	20.38	17.84
7	17.14	16.80	17.14	17.86	18.88	18.15	18.60	17.89	*a*	20.86	19.91	17.83
8	16.95	17.02	16.76	18.88	18.38	18.11	18.50	17.90	*a*	21.1	20.01	17.58
9	17.15	16.85	16.65	18.82	18.34	18.01	18.65	17.62	18.45	21.14	19.68	17.48
10	17.20	17.15	16.55	18.56	18.18	18.43	19.45	*a*	*a*	21.43	19.92	17.92
11	17.32	17.00	16.90	18.23	18.02	18.72	19.00	*a*	*a*	21.54	20.19	17.82
12	17.28	16.68	16.92	18.10	18.10	18.28	18.60	*a*	19.70	23.84	20.39	17.64
13	17.28	17.05	16.90	17.98	18.18	18.10	18.98	*a*	19.38	24.88	20.71	17.58
14	17.55	16.88	17.24	17.90	18.04	18.24	18.73	*a*	19.14	23.95	20.2	17.44
15	17.80	17.00	16.84	17.78	17.60	18.76	18.54	*a*	18.84	22.68	19.8	17.26
16	17.98	16.80	16.82	17.82	17.82	19.84	18.45	17.80	18.61	21.72	19.42	17.59
17	17.75	16.78	16.82	17.58	17.83	19.48	18.33	*a*	18.81	21.21	19.35	17.84
18	17.62	16.68	16.81	17.57	17.56	19.78	18.34	*a*	19.74	21.55	20.18	17.96
19	17.70	16.70	17.26	17.38	19.55	18.84	18.21	*a*	20.36	21.09	20.38	17.7
20	17.48	16.45	17.10	17.27	19.62	18.21	18.24	*a*	19.98	20.42	20.07	17.73
21	17.30	16.77	17.45	18.06	19.50	18.35	18.26	*a*	20.24	20.22	19.85	17.54
22	16.90	16.78	17.98	18.40	19.31	18.34	18.07	*a*	20.39	19.88	19.89	17.30
23	17.15	16.65	17.45	18.22	18.94	18.86	18.09	17.42	20.44	19.56	20.78	17.30
24	16.85	16.71	17.52	18.22	18.80	20.00	18.92	*a*	20.34	19.42	21.12	17.25
25	16.80	16.75	17.42	18.03	18.70	20.58	19.60	*a*	20.28	19.54	21.11	17.20
26	16.80	16.51	17.82	18.10	18.60	21.29	18.72	*a*	20.16	19.36	21.29	17.04
27	16.70	16.50	20.02	18.58	18.30	20.40	19.11	*a*	19.91	19.38	20.6	17.04
28	16.50	16.71	19.36	18.23	18.24	20.06	18.76	*a*	21.84	19.24	20.43	17.06
29	16.68	16.67	18.77	18.33	17.94	19.67	18.56	......	22.61	19.15	19.74	17.36
30	16.95	16.73	18.62	18.26	18.56	19.01	18.61	......	21.90	19.26	19.18	17.54
31	16.95	16.88	......	19.58	......	18.46	18.45	......	21.55	......	18.96	......

a No record.

HUDSON RIVER ABOVE FEDERAL DAM, TROY

This station is located at the upper end of the Federal lock at Troy and indicates the water-surface of the Hudson river above the Federal dam, completed November 18, 1915. The gage is an inlaid tile vertical staff on the east lock wall and is read twice daily — at 8 A. M. and 4 P. M. — to tenths. The zero of this gage is 2 feet below mean sea-level and 1.13 feet below Barge canal datum.

Records are taken and furnished by the United States Engineer Office, Albany, N. Y. Records obtained during construction prior to October 1, 1915, have not been published.

Daily elevation of water-surface (above M. S. L.) of HUDSON RIVER ABOVE FEDERAL DAM AT TROY, for the year ended June 30, 1919. J. D. Flenniken, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	17.17	16.77	17.07	18.12	19.72	18.12	18.37	18.17	18.42	19.97	18.62	18.22
2.....	17.82	16.72	16.62	17.87	19.47	17.97	19.17	18.02	19.42	19.62	18.67	18.17
3.....	17.32	16.62	16.67	17.82	19.12	18.02	19.82	17.72	18.97	19.42	19.17	18.17
4.....	17.17	16.57	16.97	17.82	18.97	17.92	19.27	17.87	18.72	19.47	19.02	17.87
5.....	17.12	16.62	16.77	17.77	18.77	17.97	18.67	17.77	18.67	19.57	19.22	17.87
6.....	17.17	16.62	16.87	17.97	18.62	18.12	18.42	17.82	19.02	19.67	19.52	17.67
7.....	17.12	16.82	17.02	17.92	18.42	18.07	18.32	17.77	18.72	19.97	19.27	17.62
8.....	17.02	16.92	16.72	18.52	18.22	17.82	18.37	17.72	18.47	20.12	19.32	17.47
9.....	16.97	16.72	16.67	18.42	18.17	17.82	18.47	17.47	18.37	20.07	19.12	17.37
10....	17.17	17.02	16.57	18.27	17.87	18.27	18.47	17.42	19.92	20.27	19.27	17.72
11.....	17.42	16.97	16.72	18.02	17.87	18.42	18.32	17.62	19.67	20.37	19.67	17.67
12.....	17.17	16.72	16.72	17.77	17.92	18.17	18.42	17.62	19.27	21.87	19.82	17.52
13.....	17.07	16.82	16.82	17.77	18.02	18.02	18.17	17.52	18.87	22.37	20.02	17.47
14.....	17.37	16.87	17.17	17.67	17.87	18.07	18.07	17.52	18.82	21.87	19.57	17.27
15.....	17.77	17.02	16.72	17.72	17.57	18.52	18.07	17.62	18.57	20.97	19.12	17.27
16.....	17.92	16.67	16.77	17.67	17.62	19.42	17.97	17.67	18.37	20.37	18.92	17.52
17.....	17.67	16.77	16.72	17.52	17.77	19.12	18.07	17.72	18.47	19.97	18.92	17.67
18.....	17.47	16.67	17.17	17.52	17.67	18.82	18.02	17.72	19.27	20.27	19.47	17.77
19.....	17.57	16.67	17.17	17.42	19.07	18.37	17.92	17.62	19.87	19.92	19.62	17.52
20.....	.42	16.57	17.07	17.12	19.17	17.92	17.97	17.57	19.42	19.57	19.52	17.62
21.....	17.17	16.72	17.37	17.92	19.02	18.17	17.97	17.52	19.62	19.37	19.12	17.32
22.....	16.87	16.72	17.77	18.22	18.67	18.17	17.92	17.47	19.67	19.17	19.27	17.07
23.....	17.02	16.67	17.37	18.02	18.67	18.57	17.92	17.32	19.77	18.92	19.77	17.17
24.....	16.87	16.67	17.47	17.97	18.47	19.67	18.42	17.37	19.52	18.82	19.97	17.17
25.....	16.82	16.77	17.42	17.87	18.42	20.12	18.62	17.52	19.47	18.92	20.02	17.07
26.....	16.77	16.52	17.82	17.92	18.57	20.47	18.62	17.57	19.42	18.82	20.02	16.97
27.....	16.67	16.52	19.42	18.32	18.12	19.87	18.57	17.82	19.32	18.87	19.62	17.07
28.....	16.67	16.62	18.87	18.02	17.97	19.37	18.47	17.67	19.92	18.72	19.52	17.27
29.....	16.67	16.62	18.42	18.02	17.87	18.92	18.37	......	20.97	18.62	19.02	17.27
30.....	16.82	16.72	18.22	17.87	18.32	18.62	18.27	......	20.47	18.72	18.62	17.52
31.....	16.87	16.77	......	19.37	......	18.27	18.17	......	20.22	......	18.42	......

NOTE.—To reduce readings to B. C. datum, add 0.87. These figures represent the actual readings, minus two feet. Previous reports show correction applied to agree with title designation of "B. C. datum."

HUDSON RIVER BELOW FEDERAL DAM, TROY

This station, established May 1, 1916, is located at the lower end of the Federal lock at Troy and indicates the water-surface of the Hudson river below the Federal dam. The gage is an inlaid tile vertical staff on the east lock wall. The zero of this gage, which is at the plane of lowest low water in this vicinity (see description under "Hudson River at Albany," page 261), is 2 * feet below mean sea-level and 1.13 * feet below Barge canal datum. The water-surface was affected by the remains of the old State dam until July 26, 1916, when the removal of the old structure was completed.

Beginning July 1, 1917, the record at this station is that of lower low tide and lower high tide, taken to the nearest tenth of a foot.

* Emendation.— Erroneously published in the 1916, 1917 and 1918 State Engineer's reports as 16 feet and 15.13 feet, respectively.

Daily record of elevation (above M. S. L.) of LOWER HIGH TIDE IN HUDSON RIVER BELOW FEDERAL DAM AT TROY, for the year ended June 30, 1919. J. D. Flenniken, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	4.1	3.8	4.4	4.4	6.8	2.8	5.2	3.0	6.1	7.8	5.7	5.5
2	4.5	3.1	3.4	4.4	6.1	4.0	6.7	2.2	6.5	6.8	6.0	5.4
3	3.0	3.9	3.9	4.0	5.1	4.8	7.1	2.9	6.1	6.6	6.2	5.0
4	3.7	3.4	4.1	3.8	5.7	4.7	5.9	4.1	6.0	6.6	5.7	4.4
5	3.1	3.5	4.3	4.7	4.7	3.0	4.6	4.0	5.9	7.1	5.9	4.2
6	4.1	3.3	4.1	4.2	5.5	3.9	5.1	3.8	5.3	7.5	6.0	3.8
7	3.7	3.4	3.6	4.0	4.8	4.5	5.8	3.6	5.1	7.9	6.2	4.2
8	3.2	3.8	3.3	7.3	4.3	4.4	5.7	3.6	5.0	7.7	6.0	3.8
9	3.8	3.6	3.6	4.9	5.1	4.2	5.6	3.1	6.7	7.9	5.2	4.2
10	4.4	4.2	3.3	4.7	3.8	3.9	5.0	2.5	6.8	8.7	6.2	4.3
11	3.9	4.0	4.4	4.4	3.8	5.1	3.9	4.1	6.4	9.5	7.5	4.2
12	3.4	3.6	4.0	4.2	4.3	4.7	3.2	4.2	5.6	13.9	7.2	4.1
13	3.7	3.7	4.0	4.2	4.2	4.2	3.6	3.8	5.0	14.2	7.7	4.4
14	3.2	3.7	4.0	4.2	4.5	5.2	3.7	4.7	4.4	13.5	7.7	4.5
15	4.0	3.0	3.7	3.4	4.3	5.6	4.1	4.8	4.8	11.2	6.7	4.5
16	4.1	3.6	4.2	3.6	3.8	6.3	4.0	4.1	5.0	9.3	6.3	4.5
17	4.0	3.6	4.3	3.8	4.6	5.9	4.0	2.8	5.2	8.5	6.2	4.6
18	3.9	2.7	3.8	4.0	5.8	6.2	4.4	3.4	6.5	8.5	6.9	4.4
19	4.0	3.2	4.5	4.4	6.6	5.0	4.4	2.1	6.8	7.4	7.0	4.4
20	4.0	2.8	4.2	4.8	6.7	4.6	4.2	2.8	6.3	6.6	6.6	4.0
21	3.8	3.2	3.8	4.6	6.1	4.4	4.1	3.5	6.7	6.0	6.1	3.4
22	3.8	3.3	4.0	4.8	5.5	4.3	4.1	3.7	5.9	5.3	6.9	3.7
23	3.6	3.7	4.0	4.7	4.6	5.5	3.5	4.3	5.9	5.4	7.8	3.6
24	3.3	3.8	4.0	4.5	4.5	6.4	4.4	2.1	5.7	5.8	7.9	4.0
25	3.9	3.5	3.9	4.6	4.0	8.7	3.6	3.1	6.1	5.2	7.8	4.0
26	4.0	3.8	5.7	4.1	3.9	8.6	4.7	3.6	6.0	4.5	8.0	4.5
27	3.9	3.4	5.9	4.6	3.9	6.9	4.5	3.9	6.5	4.9	7.1	5.0
28	3.9	4.4	5.8	4.6	4.2	6.0	4.4	4.5	9.5	5.7	7.1	3.5
29	4.0	3.7	5.2	4.5	4.9	5.0	4.7	......	9.7	5.4	6.6	4.3
30	4.1	4.0	4.3	4.4	4.1	4.8	4.5	......	8.3	5.2	5.8	4.7
31	3.0	3.5	......	6.8	......	4.8	4.0	......	8.2	......	5.8	......

NOTE.— To reduce these elevations to Barge canal datum, add 0.87. These figures represent the actual readings, minus 2 feet.

Daily record of elevation (above M. S. L.) of LOWER LOW TIDE IN HUDSON RIVER BELOW FEDERAL DAM AT TROY, for the year ended June 30, 1919. J. D. Flenniken, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.5	-0.2	-0.3	0.8	5.6	0.1	2.0	0.7	1.8	6.4	3.0	2.0
2	0.4	-0.2	-0.3	1.0	4.8	0.0	3.4	0.5	4.6	5.3	3.4	2.0
3	0.0	-0.6	0.2	1.0	3.4	1.6	5.5	0.5	3.9	4.9	4.0	1.4
4	-0.3	-0.1	0.5	0.5	3.0	1.2	4.3	1.4	3.6	5.0	3.5	1.1
5	-0.2	-0.0	0.1	0.8	2.3	0.5	3.1	1.3	3.5	5.2	4.0	1.1
6	0.5	-0.2	0.2	1.0	2.5	0.8	4.2	1.0	3.4	6.0	4.4	1.0
7	-0.2	0.0	-0.1	0.1	2.5	0.1	4.8	0.7	2.7	6.8	4.5	0.6
8	-0.3	0.2	-0.3	1.6	1.2	1.2	4.6	0.5	2.0	7.2	4.0	0.8
9	0.4	0.0	-0.1	2.5	1.7	1.0	4.6	0.3	2.2	7.1	3.6	0.8
10	0.3	0.3	-0.1	1.9	1.1	1.2	3.8	-0.2	6.1	7.6	4.2	0.8
11	0.4	0.5	-0.1	1.4	0.4	2.6	2.4	1.2	4.9	7.9	5.0	0.4
12	-0.1	0.0	0.5	1.0	0.6	2.0	1.7	0.9	3.9	9.4	6.0	0.8
13	-0.2	0.1	0.5	0.9	1.5	1.2	1.6	0.9	3.0	13.5	5.8	0.5
14	0.2	-0.1	-0.1	0.4	0.7	1.8	2.0	0.6	2.5	11.3	5.1	0.5
15	0.9	-0.5	-0.1	0.2	0.5	3.7	2.0	1.4	2.2	9.3	4.4	0.5
16	1.1	-0.4	0.2	0.3	0.2	4.6	2.0	0.8	2.4	8.0	4.0	0.7
17	0.1	-0.6	0.3	0.2	0.8	3.7	2.0	-0.1	2.8	6.5	4.1	1.0
18	0.2	-0.1	0.0	0.0	0.8	3.6	2.5	0.4	3.9	7.2	4.9	1.0
19	0.3	-0.5	0.5	-0.1	4.4	2.5	2.4	-0.2	5.6	6.1	5.2	1.0
20	-0.1	-0.4	0.4	0.7	4.0	1.6	2.0	-0.2	5.0	5.0	5.0	0.6
21	0.2	-0.4	0.2	0.8	3.9	1.9	2.5	0.2	5.0	4.3	4.2	0.3
22	-0.1	-0.2	0.6	1.6	3.4	1.8	2.5	0.6	5.3	3.4	4.2	-0.5
23	0.2	-0.2	0.2	1.4	2.5	2.6	1.7	1.0	5.1	3.5	6.4	0.3
24	-0.1	-0.2	0.4	1.1	2.1	3.8	2.4	-0.4	5.1	3.9	6.6	0.0
25	0.0	-0.5	0.0	1.2	1.8	6.1	2.1	-0.2	5.0	2.6	6.8	0.3
26	0.0	-0.2	0.8	1.2	0.9	7.1	3.3	0.5	4.7	2.8	6.4	0.6
27	0.0	-0.6	4.6	1.7	1.2	5.6	2.9	0.3	4.6	3.0	5.5	0.7
28	-1.0	0.3	3.4	1.6	0.6	4.6	2.5	0.9	6.5	3.0	4.9	-1.0
29	0.2	0.2	1.5	1.7	1.7	3.0	2.4	......	8.4	3.0	4.0	0.0
30	0.2	-0.3	1.7	1.2	1.1	2.7	1.5	......	7.6	3.0	3.0	1.0
31	-0.6	0.8	......	3.6	......	1.5	1.6	......	7.3	......	2.5	......

NOTE.— To reduce these elevations to Barge canal datum, add 0.67. These figures represent the actual readings, minus 2 feet.

HUDSON RIVER AT ALBANY

The following tables, furnished by the United States Engineer Office, Albany, N. Y., through the courtesy of Mr. John D. Myton, Assistant Engineer in charge, give the elevations of the lower high and lower low tide recorded daily by the automatic tide gage at the foot of State street, Albany, during the year ended June 30, 1919.

The elevations are referred to an assumed plane of lowest low water in the Hudson river at this locality, which is 2.0 feet below the mean sea-level at Sandy Hook, N. J., or 15.863 feet below the elevation of "Greenbush" bench-mark, as published in the Annual Report of the U. S. Coast and Geodetic Survey

for 1903, Appendix No. 3. The plane of mean low tide at Albany, as determined from the mean of observations taken July 3 to November 17, 1876, was about 13.40 feet below the Greenbush bench-mark and, as determined by observations taken during the same period in 1908 and 1909, was about 13.80 feet below that bench-mark.

To reduce elevations in the tables to Barge canal datum, subtract 1.13 feet.

Daily record of elevation of LOWER HIGH TIDE IN HUDSON RIVER AT ALBANY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	5.88	4.85	4.67	4.88	6.67	3.22	5.52	4.42	6.11	7.39	6.72	6.60
2......	†5.45	4.98	4.92	5.46	6.27	4.14	5.98	3.56	7.01	6.82	6.90	6.41
3......	4.87	3.97	5.63	5.55	5.53	5.90	6.99	4.53	6.78	6.88	6.18	6.12
4......	4.65	5.21	5.52	5.02	5.72	5.45	6.53	5.72	6.99	7.01	6.49	5.90
5......	4.69	5.26	5.81	5.52	5.13	4.26	5.41	5.16	7.20	7.23	6.20	5.80
6......	5.51	5.10	5.29	5.72	5.46	4.98	5.83	5.26	5.60	7.56	6.41	†5.77
7......	5.15	5.33	5.31	4.30	6.12	3.79	6.44	4.68	6.29	7.58	†6.91	5.26
8......	5.05	5.36	5.02	5.76	5.01	5.44	5.76	†5.35	5.39	†7.39	6.04	5.16
9......	5.72	5.31	5.32	5.91	5.72	5.51	5.94	4.86	6.83	7.55	5.68	5.71
10......	5.49	5.50	5.09	5.61	5.08	4.79	†4.47	4.32	†6.77	7.88	6.60	5.29
11......	5.34	5.73	4.29	5.41	4.28	6.18	4.19	4.67	6.47	8.42	7.30	4.76
12......	5.07	5.36	5.57	5.00	†5.00	†5.77	2.99	5.38	5.60	9.44	7.00	5.10
13......	5.28	5.01	5.20	5.24	5.85	5.39	3.85	5.39	5.30	11.98	7.49	5.00
14......	5.30	4.83	†4.69	†4.34	5.95	5.95	4.35	5.42	4.81	10.63	6.66	5.39
15......	5.20	†4.00	4.53	4.60	5.29	6.27	4.73	6.22	5.73	9.03	6.49	5.40
16......	†5.03	4.10	5.31	5.15	5.49	6.23	4.71	4.86	6.50	8.71	6.76	5.72
17......	4.70	3.67	5.50	5.30	5.47	6.19	4.80	4.06	6.31	7.49	7.20	5.63
18......	4.46	4.10	5.41	4.91	6.36	6.69	5.22	5.01	7.00	7.53	6.71	5.99
19......	4.72	4.38	5.99	5.18	7.46	6.61	5.73	3.45	5.81	6.50	7.28	6.09
20......	4.63	4.58	5.83	6.12	7.23	5.68	5.14	4.43	6.59	6.63	6.62	5.53
21......	4.60	5.10	5.45	5.94	6.43	5.79	5.27	4.81	6.50	5.07	6.46	5.31
22......	4.88	5.12	5.55	5.53	6.55	5.79	5.27	5.20	5.68	5.96	6.99	†4.61
23......	5.38	5.44	5.49	*5.85	5.25	6.12	5.21	4.53	5.85	6.29	†7.67	5.42
24......	5.17	5.65	5.37	*6.11	5.50	6.62	†5.78	†3.81	†5.94	†7.03	7.71	5.23
25......	5.69	5.37	5.02	5.82	5.19	†7.72	3.78	3.46	5.89	4.94	7.41	5.53
26......	5.60	5.34	5.81	5.45	†3.54	7.88	5.30	4.62	6.05	4.83	7.47	6.03
27......	5.59	4.75	6.39	†5.43	4.81	6.67	5.28	4.05	6.64	5.38	7.12	5.59
28......	5.59	5.25	†6.23	5.81	4.29	6.40	4.60	5.46	7.47	6.55	7.12	4.59
29......	5.36	†5.67	5.22	5.89	5.87	5.78	5.41	......	7.57	5.98	6.73	6.00
30......	5.58	4.57	5.64	5.88	4.18	5.65	4.92	......	7.39	6.17	6.39	5.76
31......	†4.29	5.31	......	6.37	......	4.68	5.70	......	8.02	......	6.52	......

† One tide only.
* One reading; only one tide recorde

Daily record of elevation of LOWER LOW TIDE IN HUDSON RIVER AT ALBANY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	2.41	1.69	1.53	2.43	†5.38	1.15	3.48	1.91	†3.92	6.19	3.89	3.51
2......	2.27	1.84	1.72	2.82	5.41	†2.40	3.11	1.27	5.36	5.33	3.99	3.50
3......	1.61	1.09	2.28	†2.71	3.89	3.13	5.76	1.47	4.61	5.13	4.54	3.11
4......	1.27	1.95	†2.59	2.05	3.75	2.83	4.87	2.79	4.36	5.18	4.27	2.66
5......	1.66	1.97	2.37	2.44	3.07	1.79	4.15	2.84	4.60	5.49	4.57	2.75
6......	2.27	†1.89	2.31	2.70	3.38	2.11	5.14	2.45	4.06	5.91	4.73	2.50
7......	1.70	1.97	2.07	1.65	3.72	1.70	5.31	2.35	3.80	6.50	5.00	2.06
8......	†1.91	2.12	1.68	2.91	2.48	2.86	4.88	2.14	3.55	6.60	4.35	2.46
9......	1.79	2.08	2.08	3.54	3.05	2.81	4.54	2.02	3.31	6.69	4.15	2.66
10......	2.39	1.97	2.10	3.23	2.53	2.64	3.76	1.64	5.85	7.30	4.76	2.38
11......	2.29	2.63	1.75	2.93	1.94	3.50	2.93	2.85	5.05	7.57	†6.07	2.00
12......	1.90	2.05	2.71	2.58	2.21	3.30	2.01	†3.14	4.33	10.00	6.04	2.40
13......	1.88	2.04	2.63	2.53	2.95	2.78	2.55	2.79	3.49	11.62	6.00	†2.45
14......	2.10	1.97	2.10	1.83	2.48	3.27	†2.94	2.64	†3.24	†10.86	5.92	2.30
15......	2.40	1.47	2.03	1.84	2.31	3.89	3.24	3.27	3.39	8.74	4.91	2.41
16......	2.54	1.51	2.28	2.05	1.88	†4.83	3.26	2.54	3.74	7.51	4.79	2.51
17......	1.97	1.17	2.22	2.06	†2.47	4.38	3.26	1.48	3.76	6.62	4.65	2.73
18......	1.97	1.35	2.11	1.51	2.71	4.32	3.62	1.93	4.48	6.81	5.42	2.71
19......	2.19	1.36	2.59	†1.97	5.02	3.94	3.92	1.28	5.50	5.92	5.39	2.84
20......	1.79	1.46	†2.48	2.57	4.91	2.99	3.55	1.10	5.00	5.42	5.25	2.25
21......	1.70	1.86	2.10	2.81	4.39	3.27	3.79	2.12	5.30	4.50	4.88	1.91
22......	1.76	†1.99	2.47	2.86	4.25	3.08	3.58	2.55	5.11	3.88	4.77	1.19
23......	2.08	1.74	2.11	2.94	3.27	3.68	3.41	3.08	4.90	4.08	6.28	1.93
24......	†2.02	2.09	2.27	*2.83	3.29	5.03	3.99	0.95	4.78	4.40	6.33	1.88
25......	1.86	1.66	2.09	2.81	3.08	5.89	3.17	1.73	5.17	3.23	6.33	2.27
26......	2.11	1.83	2.61	2.73	2.04	6.65	4.72	1.84	4.83	3.33	6.25	2.54
27......	2.01	1.13	4.96	2.92	2.65	5.52	4.22	1.96	5.11	3.57	5.38	†2.82
28......	1.90	1.87	4.12	3.15	2.04	4.88	3.76	2.68	6.40	3.93	5.02	1.20
29......	2.10	2.50	2.80	3.10	3.11	3.94	†3.87	......	†7.92	†3.82	†4.82	1.75
30......	2.18	1.49	3.03	2.95	2.30	†3.88	3.05	......	6.79	3.45	3.98	2.72
31......	1.29	2.17	......	4.82	......	2.73	2.95	......	6.77	......	3.66	......

† One tide only.
* One reading; only one tide recorded.

DIFFERENCE IN TIME AND RANGE OF TIDES ON HUDSON RIVER

The following table, prepared by the Corps of Engineers, U. S. A., shows the difference in time between the occurrence of high or low tide at Albany and at various localities on the Hudson river from Troy to New York, also the amounts of mean tidal range at the same localities.

To obtain the actual time of any desired high or low tide at a given locality apply the correction indicated in the table to the time of the same tide at Albany.

LOCALITY	DISTANCE FROM ALBANY	DIFFERENCE	HIGH WATER		LOW WATER		MEAN RANGE
	Miles	+ or —	Hours	Minutes	Hours	Minutes	Feet
Troy (Congress St.).....	6¼	Add	0	23	0	36	2.32
Albany..................	0	....	......	......	......	......	2.38
Castleton...............	8¼	Subtract	0	56	1	00	2.78
New Baltimore...........	15	Subtract	1	45	2	00	3.21
Stuyvesant..............	19	Subtract	2	08	2	29	3.50
Coxsackie...............	21	Subtract	2	35	2	57	3.56
Hudson..................	28	Subtract	3	00	3	55	4.08
Catskill................	33	Subtract	3	16	3	56	4.20
Germantown..............	39	Subtract	3	48	4	26	4.10
Saugerties-Tivoli.......	44	Subtract	4	10	4	50	4.00
Rondout-Rhinebeck.......	56	Subtract	4	26	5	10	3.90
Poughkeepsie............	70	Subtract	4	57	5	47	3.10
New York (Governor's Island).............	145	Subtract	9	50	11	02	4.40

INDIAN RIVER

INDIAN LAKE RESERVOIR AT INDIAN LAKE

Location.—At the masonry storage dam at the outlet of Indian lake; about 2 miles south of Indian Lake village, Hamilton county, and about 7½ miles above the confluence of Indian river with the Hudson.

Drainage area.—131 square miles, including about 9.3 square miles of water-surface of Indian lake at the elevation of crest of spillway. (Measured on U. S. Geological Survey topographic maps.)

Records available.—Records of stage and gate openings, July, 1900, to June 30, 1919.

Gages.—Elevation of water-surface in reservoir is determined by chain gage on the crest of the dam near the gate-house. Gage installed November 17, 1911, to replace staff gage previously maintained at the same point. Mean elevation of crest of spillway is at gage height, 33.38 feet. Widths of sluice-gate openings determined by gage scales at sides of gate-stems inside gate-house. Gages read by Lester Sevarie.

Extremes of stage.—Current year: Maximum elevation of water-surface in reservoir, 35.00 feet, May 3 and 4. Minimum elevation, 18.5 feet, September 18.

1900–1919: Maximum elevation recorded, 38.8 feet, March 28, 1913. Minimum elevation, 2.0 feet, March 9 to 18, 1907, and January 3 to 17, 1910.

Regulation.—At ordinary stages the discharge is completely regulated by the operation of the sluice-gates. Water is held in storage until needed to supplement the flow of the upper Hudson during the low-water period. This storage capacity of about 4.7 billion cubic feet provides for a discharge of approximately 600 second-feet for a period of 90 days.

Coöperation.— Station maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Daily gage height, in feet, of INDIAN LAKE RESERVOIR AT INDIAN LAKE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	33.65	32.2	22.5	19.95	22.8	27.25	31.1	29.9	20.8	27.1	34.75	33.65
2	33.65	32.0	22.15	20.0	23.0	27.35	31.3	29.7	20.6	27.3	34.8	33.65
3	33.65	31.75	21.8	20.1	23.2	27.45	31.5	29.5	20.3	27.6	35.0	33.65
4	33.7	31.4	21.6	20.2	23.4	27.55	31.6	29.3	20.0	27.8	35.0	33.65
5	33.7	31.1	21.45	20.3	23.6	27.6	31.7	29.1	19.8	27.9	34.8	33.65
6	33.75	30.8	21.2	20.4	23.8	27.65	31.8	28.85	20.0	28.0	34.6	33.65
7	33.8	30.55	21.0	20.65	24.2	27.7	31.9	28.7	20.2	28.2	34.4	33.65
8	33.85	30.3	20.7	20.8	24.6	27.75	31.95	28.45	20.35	28.65	34.4	33.65
9	33.9	30.0	20.35	20.95	24.5	27.8	32.0	27.6	20.5	29.3	34.4	33.7
10	33.95	29.85	20.0	21.05	24.75	27.9	32.05	27.3	20.75	30.0	34.4	33.7
11	34.0	29.55	19.7	21.1	24.9	27.95	32.1	26.9	20.9	30.8	34.4	33.75
12	34.05	29.25	19.4	20.2	25.2	28.0	32.1	26.5	21.0	32.5	34.35	33.75
13	34.1	29.0	19.1	20.25	25.3	28.05	32.15	26.15	21.1	33.3	34.35	33.75
14	34.1	28.75	18.85	21.3	25.45	28.15	32.2	25.8	21.2	33.8	34.35	33.8
15	34.15	28.55	18.75	21.35	25.5	28.3	32.2	25.4	21.3	34.1	34.35	33.9
16	34.2	28.25	18.65	21.4	25.6	28.5	32.25	25.1	21.4	34.2	34.15	33.95
17	34.2	28.0	18.55	21.45	25.7	28.6	32.25	24.8	21.5	34.3	34.25	34.0
18	34.2	27.65	18.5	21.5	25.8	28.7	32.25	24.55	21.75	34.5	34.6	34.0
19	34.15	27.25	18.55	21.55	25.9	28.8	32.25	24.15	22.0	34.65	34.7	34.0
20	34.15	26.85	18.55	21.6	26.05	28.9	32.3	23.75	22.3	34.75	34.7	33.95
21	34.1	26.45	18.65	21.7	26.2	29.0	32.0	23.35	22.6	34.8	34.7	33.95
22	34.0	26.1	18.75	21.8	26.35	29.1	31.7	23.05	23.0	34.8	34.75	33.95
23	34.0	25.65	18.8	21.85	26.5	29.3	31.5	22.8	23.45	34.8	34.85	33.95
24	33.9	25.2	18.85	22.0	26.6	30.0	31.3	22.45	23.9	34.85	34.95	33.9
25	[illegible]	24.9	18.9	22.1	26.7	30.3	31.2	22.05	24.2	34.9	34.95	33.9
26	33.5	24.45	19.05	22.2	26.75	30.5	31.1	21.7	24.5	34.85	34.75	33.9
27	33.35	24.05	19.35	22.3	26.8	30.7	30.95	21.45	24.9	34.	34.55	34.05
28	33.05	23.65	19.5	22.4	26.85	30.85	30.7	21.1	25.8	34.75	34.4	34.15
29	32.85	23.3	19.7	22.5	26.95	30.95	30.5	......	26.2	34.75	34.4	34.15
30	32.5	23.0	19.85	22.6	27.1	31.0	30.3	......	26.6	34.75	34.3	34.2
31	32.35	22.75	......	22.7	......	31.05	30.1	......	26.9	......	33.7	......

Gate openings, in inches, at INDIAN LAKE RESERVOIR AT INDIAN LAKE, for the year ended June 30, 1919

FROM		TO		Sluice-gate A open	Sluice-gate B open
Date	Hour	Date	Hour		
				Inches	*Inches*
July 24	9 A. M.	July 25	6 P. M.	....	54
July 25	6 P. M.	July 27	5 P. M.	....	30
July 27	5 P. M.	Sept. 14	4 P. M.	....	54
Aug. 18	7 A. M.	Sept. 3	11 A. M.	60	....
Sept. 7	5 P. M.	Sept. 20	6 P. M.	60	....
Sept. 14	4 P. M.	Jan. 20	8 P. M.	....	Closed
Sept. 20	6 P. M.	Feb. 6	1 P. M.	Closed	....
Jan. 20	8 P. M.	Mar. 5	2 P. M.	....	54
Feb. 6	1 P. M.	Mar. 5	2 P. M.	60	....
April 15	9 P. M.	April 17	7 P. M.	60	....
April 18	1 P. M.	April 18	7 P. M.	60	....
May 6	4 P. M.	May 7	9 P. M.	48	....
May 31	1 P. M.	June 1	1 P. M.	60	....
June 1	....	June 30	....	Closed	....

NOTE.— The main logway was open 1 foot in width from 7 P. M., August 3, to 7 A. M., August 18. It was open 15 feet during the following periods: May 5, 5 A. M. to 4 P. M.; May 16, 5 A. M. to 3 P. M.; May 26, 5 A. M. to 6 P. M.; May 27, 1 P. M. to 6 P. M.; May 28, 6 A. M. to 5 P. M. It was also open 7 feet 6 inches from 1 P. M., May 31, to 1 P. M., June 1.

INDIAN RIVER NEAR INDIAN LAKE

Location.— About ¾ mile below the State dam at the outlet of Indian lake, about 2 miles south of Indian Lake village, Hamilton county, 1 mile above the mouth of Big brook and 6½ miles above the mouth of Indian river.

Drainage area.— 132 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— July 1, 1912, to June 30, 1914; June 5, 1915, to June 30, 1919; also miscellaneous measurements in 1911.

Gage.— Gurley 7-day graph water-stage recorder, installed August 30, 1916. In standard wooden shelter on the right bank about ¾ mile below the dam, at same datum as staff gage previously used. The staff gage is still in place and used for checking the recorder. Recorder inspected by Lester Sevarie.

Discharge measurements.— Made from a cable or by wading at the head of the rapids about 150 feet below the gage.

Channel and control.— The gnge is at the side of a pool about 500 feet wide, called the "lower frog-pond." The reef of coarse gravel at the outlet of this pool forms the control and is permanent.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 5.88 feet at 9 A. M., May 5; discharge, 2,060 second-feet. Minimum stage from water-stage recorder, 0.04 foot at 5 A. M., October 2; discharge, 1.3 second-feet.

1912–1919: Maximum stage recorded, 7.8 feet at 4 P. M., March 28, 1913; discharge, 3,460 second-feet. Minimum stage from water-stage recorder, 0.07 foot at 12 P. M., September 30, 1918; discharge, about 0.7 second-foot.

Winter flow.— Discharge relation not affected by ice.

Regulation.— Discharge at this station is regulated by the operation of gates at the dam.

Accuracy.— Stage-discharge relation permanent. Rating curve well defined between 15 and 1,500 second-feet. Daily discharge ascertained by applying mean daily gage height to rating table for days when there have been no changes in the sluice-gate openings at Indian lake dam. Mean daily gage height determined by

inspection of the hydrograph record. Discharge for days when gate openings are changed is mean of 24 hourly discharge values.

Coöperation. — Station maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of INDIAN RIVER NEAR INDIAN LAKE, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
		Feet	*Sec.-ft.*
1918			
July 15*a*.......	J. W. Moulton....................................	1.40	91.3
Nov. 14.......	E. D. Burchard....................................	0.25	5.22
1919			
Feb. 11.......	E. D. Burchard....................................	3.56	838
Apr. 6.......	M. H. Carson....................................	0.54	10.4

a Logs on control.

Daily gage height, in feet, of INDIAN RIVER NEAR INDIAN LAKE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	0.77	2.9	3.3	0.06	0.25	0.42	0.88	2.95	3.3	0.43	2.5	*a*
2......	0.87	2.9	3.3	0.05	*a*	0.41	0.91	2.95	3.25	0.44	2.65	1.78
3......	0.90	*a*	*a*	0.09	*a*	0.41	0.91	2.9	3.25	0.46	2.8	*a*
4......	0.98	3.05	2.6	0.10	*a*	0.42	0.96	2.9	3.2	0.50	2.85	0.95
5......	1.01	3.05	2.6	0.08	*a*	0.42	0.95	2.9	*a*	0.54	*a*	0.7
6......	1.01	3.05	2.6	0.19	*a*	0.45	0.96	*a*	0.30	0.58	*a*	0.98
7......	1.04	3.05	*a*	0.19	*a*	0.48	0.96	3.65	0.20	0.61	*a*	1.00
8......	1.02	3.05	3.2	0.13	0.20	0.49	0.97	3.65	0.18	0.62	2.55	1.01
9......	1.05	3.0	3.2	0.10	0.20	0.49	0.97	3.6	0.16	0.68	2.55	1.02
10......	1.11	3.0	3.15	0.08	0.21	0.49	0.97	3.6	0.20	0.76	2.5	1.01
11......	1.19	3.0	3.15	0.06	0.22	0.50	1.00	3.55	0.17	0.93	2.5	1.01
12......	1.27	2.95	3.15	0.08	0.22	0.50	1.00	3.55	0.13	1.07	2.55	1.00
13......	1.36	3.0	3.1	0.07	0.22	0.50	1.00	3.55	0.14	1.11	2.55	1.00
14......	1.37	3.0	*a*	0.07	0.25	0.52	0.99	3.5	0.14	1.25	2.55	1.09
15......	1.40	2.95	1.83	0.07	0.26	0.56	0.99	3.5	0.12	*a*	2.5	1.18
16......	1.40	2.95	1.82	0.06	0.25	0.57	1.00	3.45	0.12	2.95	*a*	1.18
17......	1.44	2.95	1.82	0.07	0.25	0.56	1.01	3.45	0.11	*a*	2.6	1.23
18......	1.42	*a*	1.81	0.06	0.29	0.57	1.03	3.4	0.20	*a*	2.95	1.22
19......	1.40	3.55	1.80	0.07	0.35	0.57	1.03	3.4	0.25	2.41	3.1	1.21
20......	1.44	3.5	*a*	0.06	0.32	0.59	*a*	3.4	0.29	2.55	3.15	1.19
21......	1.40	3.5	0.33	0.10	0.33	0.60	3.0	3.4	0.37	2.6	3.1	1.17
22......	1.35	3.45	0.16	0.10	0.36	0.62	3.0	3.4	0.36	2.65	3.05	1.09
23......	1.32	3.45	0.12	0.10	0.39	0.68	3.0	3.35	0.27	2.65	3.1	1.08
24......	*a*	3.4	0.10	0.10	0.39	0.72	3.0	3.35	0.26	2.7	3.2	1.06
25......	*a*	3.4	0.09	0.11	0.39	0.76	3.05	3.3	0.22	2.7	3.25	1.09
26......	2.30	3.4	0.14	0.16	0.38	0.81	3.0	3.3	0.21	2.7	*a*	1.07
27......	*a*	3.35	0.21	0.16	0.36	0.86	3.0	3.3	0.25	2.6	*a*	1.28
28......	2.95	3.35	0.14	0.16	0.36	0.88	3.0	3.3	0.45	2.55	*a*	1.30
29......	2.95	3.3	0.10	0.15	0.42	0.88	3.0	......	0.46	2.49	2.55	1.41
30......	2.9	3.3	0.09	0.20	0.44	0.87	2.95	......	0.40	2.46	2.45	1.40
31......	2.9	3.35	......	0.36	......	0.87	2.95	......	0.41	......	*a*	......

a No record.

Daily discharge, in second-feet, of INDIAN RIVER NEAR INDIAN LAKE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	18	564	725	1.5	5.2	12	51	584	725	12	418	838
2	26	564	725	1.4	4.6	11	54	584	704	13	471	207
3	30	575	590	1.8	4.3	11	54	564	704	14	526	128
4	36	623	453	1.9	4.2	12	60	564	684	16	545	59
5	40	623	453	1.7	4.0	12	59	564	896	18	1,310	62
6	40	623	453	3.7	4.0	13	60	716	6.8	21	703	63
7	42	623	473	3.7	3.9	15	60	875	3.9	23	890	66
8	40	623	684	2.4	3.9	15	62	875	3.4	24	436	67
9	46	603	684	1.9	3.9	15	62	853	3.0	29	436	69
10	50	603	664	1.7	4.2	15	62	853	3.9	37	418	67
11	60	603	664	1.5	4.4	16	66	832	3.2	57	418	67
12	75	584	664	1.7	4.4	16	66	832	2.4	76	436	66
13	85	603	643	1.6	4.4	16	66	832	2.6	82	436	66
14	90	603	453	1.6	5.2	17	65	810	2.6	108	436	79
15	90	584	220	1.6	5.5	20	65	810	2.2	175	418	92
16	90	584	217	1.5	5.2	20	66	788	2.2	584	831	92
17	100	584	217	1.6	5.2	20	67	788	2.0	594	453	100
18	95	668	214	1.5	6.5	20	70	767	3.9	433	584	98
19	90	832	212	1.6	8.6	20	70	767	5.2	388	643	97
20	100	810	187	1.5	7.5	22	158	767	6.5	436	664	94
21	90	810	6	1.9	7.9	22	603	767	9.5	453	643	90
22	85	788	2	1.9	9.0	24	603	767	9.0	471	623	79
23	80	788	1	1.9	10.0	29	603	746	5.8	471	643	77
24	448	767	1	1.9	10.0	32	603	746	5.5	489	684	74
25	570	767	1	2.0	10.0	36	623	725	4.4	489	704	79
26	353	767	1	2.8	9.9	42	603	725	4.2	489	1,280	76
27	405	746	2	3.0	9.0	46	603	725	5.2	458	796	108
28	584	746	1	3.0	9.6	51	603	725	13	436	651	127
29	584	725	1	2.8	12.0	51	603	......	14	415	436	131
30	564	725	1	3.9	13.0	49	584	......	11	405	402	129
31	564	746	......	9.0	......	49	584	......	11	......	820	......
Mean	180	673	320	2.31	6.63	24.2	257	748	108	257	618	115

NOTE.—Discharge estimated, July 1 to 25, because of logs on the control, from discharge measurements and study of gage-height graph. Discharge estimated, November 2 to 7, by computing discharge from record of gate openings at dam at Indian lake reservoir and comparing hydrograph of Hudson river near Indian Lake.

Monthly discharge of INDIAN RIVER NEAR INDIAN LAKE, for the year ended June 30, 1919

[Drainage area, 132 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	584	18	180	1.36	1.57
August	832	564	673	5.10	5.88
September	725	1	320	2.42	2.70
October	9.0	1.4	2.31	0.018	0.02
November	13.0	3.9	6.63	0.050	0.06
December	51	11	24.2	0.183	0.21
January	623	52	257	1.95	2.25
February	875	564	748	5.67	5.90
March	725	2.0	108	0.818	0.94
April	594	12	257	1.95	2.18
May	1,310	402	618	4.68	5.40
June	838	59	115	0.871	0.97
The year	1,310	1	276	2.09	28.08

SCHROON RIVER

DESCRIPTION

Schroon river rises in Essex county, along the southern slopes of the highest mountains in the Adirondack group, flows in a general southerly direction for about 45 miles through Essex and Warren counties and joins tho Hudson near Thurman. Its total drainage area is 550 square miles. Its headwaters reach an elevation of about 2,000 feet above mean tide; its mouth is at an elevation of about 600 feet.

Its basin is largely forested and contains considerable wild land and numerous lakes and ponds. The most important of these is Schroon lake, through which the river flows, which has a water-surface area of about 6.3 square miles. The only power-plants are at Warrensburg.

SCHROON RIVER AT RIVERBANK

Location.— At the steel highway bridge near Riverbank post-office, Warren county, near Tumblehead falls, about 9 miles below Schroon lake and about 9 miles above Warrensburg.

Drainage area.— 534 square miles.

Records available.— September 2, 1907, to June 30, 1919.

Gage.— Chain, on upstream side of bridge; read by J. H. Roberts.

Discharge measurements.— Made from the upstream side of bridge.

Channel and control.— Gravel; occasionally shifting. Logs become lodged on the control for a portion of nearly every year.

Extremes of discharge.— Current year: Maximum stage recorded, 6.70 feet at 8 A. M. and 4 P. M., April 13; discharge, about 4,950 second-feet. Minimum stage recorded, 1.31 feet at 3 P. M., July 5; discharge, 122 second-feet.

1907–1919: Maximum stage recorded, 10.7 feet at 5 P. M., March 28, 1913; discharge, about 13,500 second-feet. Minimum stage recorded, 0.85 foot at 5 P. M., October 17, 1909; discharge, 28 second-feet.

Ice.— Stage-discharge relation affected by ice.

Regulation.— Flow affected by storage in Schroon and Brant lakes.

Accuracy.— Stage-discharge relation probably permanent during year. Affected by ice, January 9 to 14, and by logs on the control, March 26 to June 30. Rating curve well defined between 150 and 4,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Results good for periods when the stage-discharge relation is not affected by ice or logs; fairly good for other periods.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of SCHROON RIVER AT RIVERBANK, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
		Feet	*Sec.-ft.*
1918			
July 12	J. W. Moulton	1.54	179
July 12	J. W. Moulton	1.54	180
1919			
Jan. 11 *a*	E. D. Burchard	3.20	729
Feb. 14	E. D. Burchard	2.27	425
May 10 *b*	O. W. Hartwell	3.82	1,330
June 18 *b*	C. C. Covert	2.52	584

a Partial ice cover on control.
b Logs on shallow part of control.

Daily gage height, in feet, of SCHROON RIVER AT RIVERBANK, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	2.6	1.6	1.55	2.15	3.9	3.7	3.0	2.65	2.2	5.6	3.6	3.6
2	1.44	1.6	1.5	2.0	4.0	3.3	3.1	2.6	2.25	5.4	3.6	3.5
3	1.34	1.6	1.45	2.15	4.0	3.3	3.1	2.55	2.25	5.1	3.7	3.3
4	1.34	1.55	1.44	2.05	4.1	3.3	3.1	2.5	2.3	4.9	3.6	3.6
5	1.36	1.55	1.45	2.2	4.0	3.2	3.1	2.5	2.4	4.8	3.7	3.4
6	1.38	1.5	1.43	2.4	3.9	3.2	3.2	2.5	2.35	4.6	3.7	3.1
7	1.45	1.5	1.45	2.8	3.8	3.0	3.2	2.45	2.45	4.8	3.7	2.75
8	1.39	1.45	1.55	3.4	3.7	3.0	2.9	2.4	2.45	5.1	3.8	3.0
9	1.35	1.44	1.45	3.5	3.5	2.95	2.9	2.4	2.7	5.1	3.8	2.8
10	1.45	1.41	1.42	3.4	3.4	2.95	3.2	2.35	2.8	5.2	3.8	2.75
11	1.48	1.55	1.48	3.3	3.5	2.85	3.3	2.3	2.75	5.5	3.1	3.3
12	1.5	1.55	1.47	3.2	3.2	2.9	3.4	2.3	2.75	6.2	4.0	3.0
13	1.5	1.55	1.5	3.6	3.2	3.0	3.2	2.3	2.85	6.7	4.0	3.3
14	1.55	1.55	1.5	3.7	3.1	3.1	2.9	2.25	2.75	6.6	4.0	2.45
15	1.7	1.6	1.49	3.0	3.0	3.0	2.85	2.25	2.75	6.0	4.1	2.45
16	1.7	1.55	1.48	2.1	3.0	3.1	3.0	2.2	2.75	5.9	3.8	3.3
17	1.8	1.55	2.4	2.3	3.0	3.1	2.85	2.2	2.8	5.9	3.8	3.5
18	1.9	1.45	2.75	2.35	3.1	3.1	2.8	2.2	2.9	5.7	3.9	3.5
19	1.9	1.49	2.55	2.35	3.6	3.1	2.75	2.2	3.1	5.6	4.0	3.1
20	1.8	1.43	1.7	2.3	4.0	3.0	2.8	2.15	3.5	5.4	4.1	3.5
21	1.8	1.41	1.6	2.45	4.0	2.95	2.85	2.1	3.7	5.2	4.0	2.25
22	1.8	1.40	1.55	2.5	4.1	2.95	2.7	2.1	4.1	5.0	4.3	2.2
23	1.8	1.43	2.1	2.6	4.1	2.7	2.65	2.05	4.4	4.8	5.2	2.2
24	1.75	1.43	2.1	2.6	4.0	2.8	2.8	2.1	4.5	4.6	5.6	2.2
25	1.75	1.39	2.1	2.4	4.0	3.0	2.9	2.05	4.6	4.5	5.7	2.25
26	1.7	1.39	2.2	2.6	3.8	3.2	2.8	2.0	4.5	4.4	5.6	2.4
27	1.65	1.38	1.9	2.5	3.7	3.2	2.8	2.0	4.5	4.2	5.0	3.5
28	1.65	1.40	2.05	2.6	3.5	3.2	2.8	2.05	4.7	3.9	4.8	3.0
29	1.7	1.38	2.05	2.65	3.6	3.2	2.8	......	5.5	3.9	4.4	2.2
30	1.7	1.39	2.1	2.7	3.5	3.2	2.75	......	5.9	*a*	4.2	2.45
31	1.65	1.35	......	3.2	......	3.0	2.7	......	5.9	......	4.0	......

a No record.

Daily discharge, in second-feet, of SCHROON RIVER AT RIVERBANK, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	585	201	186	388	1,460	1,290	800	610	407	3,200	1,100	1,100
2.....	156	201	172	333	1,550	990	860	585	427	3,900	1,100	1,100
3.....	130	201	158	388	1,550	990	860	560	427	2,600	1,200	1,000
4.....	130	186	156	351	1,640	990	860	535	447	2,400	1,100	1,100
5.....	135	186	158	407	1,550	920	860	535	490	2,200	1,300	1,100
6.....	140	172	153	490	1,460	920	920	535	468	2,200	1,200	850
7.....	158	172	158	690	1,370	800	920	512	512	2,400	1,200	850
8.....	140	158	186	1,060	1,290	800	745	490	512	2,600	1,400	750
9.....	132	154	158	1,160	1,130	772	750	490	635	2,800	1,400	700
10....	158	148	150	1,060	1,060	772	750	468	690	2,800	1,400	650
11.....	167	186	167	990	1,130	718	750	447	662	3,000	1,600	1,000
12.....	172	186	161	920	920	745	700	447	662	4,000	1,500	750
13.....	172	186	172	1,210	920	800	700	447	718	4,800	1,500	900
14.....	186	186	172	1,290	860	860	700	427	662	4,600	1,500	500
15.....	232	201	169	800	800	860	718	427	662	3,800	1,600	600
16.....	232	186	167	369	860	860	800	407	662	3,800	1,400	420
17.....	264	186	490	447	800	860	718	407	690	3,600	1,400	500
18.....	298	158	662	468	860	860	690	407	745	3,400	1,450	380
19.....	298	169	560	468	1,210	800	662	407	860	3,200	1,500	360
20.....	281	153	232	447	1,350	890	690	388	1,160	3,000	1,800	500
21.....	264	148	201	512	1,550	772	718	369	1,290	2,800	1,500	400
22.....	264	145	186	535	1,640	772	635	369	1,640	2,400	1,700	380
23.....	264	153	369	585	1,640	635	610	351	1,940	2,400	2,800	380
24.....	248	153	369	585	1,550	690	690	369	2,010	2,200	3,200	380
25.....	248	142	369	490	1,550	800	745	351	2,150	2,000	3,400	420
26.....	232	142	407	585	1,370	920	690	333	2,000	1,800	3,400	460
27.....	216	140	298	535	1,290	920	690	333	2,000	1,600	2,600	500
28.....	216	145	351	585	1,130	920	690	351	2,200	1,600	2,400	320
29.....	232	140	351	610	1,210	920	690	......	3,000	1,400	1,900	380
30.....	232	142	369	635	1,130	920	662	......	3,600	1,400	1,700	500
31.....	216	132	......	920	......	800	635	......	3,600	......	1,600	......
Mean...	219	166	262	654	1,270	854	739	441	1,220	2,770	1,720	635

NOTE.— Stage-discharge relation affected by ice, January 9 to 14, and by logs on control, March 26 to June 30. Daily discharge for these periods is approximate.

Monthly discharge of SCHROON RIVER AT RIVERBANK, for the year ended June 30, 1919

[Drainage area, 534 square miles]

MONTH	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	585	130	219	0.410	0.47
August	201	132	166	0.311	0.36
September	662	158	262	0.492	0.55
October	1,290	333	654	1.22	1.41
November	1,640	800	1,270	2.38	2.66
December	1,290	635	854	1.60	1.85
January	920	610	739	1.38	1.59
February	610	333	441	0.826	0.86
March	3,600	407	1,220	2.28	2.63
April	4,800	1,400	2,770	5.19	5.79
May	3,400	1,100	1,720	3.24	3.74
June	1,100	320	635	1.19	1.33
The year	4,800	130	913	1.71	23.24

SACANDAGA RIVER

DESCRIPTION

Sacandaga river is one of the larger tributaries of the upper Hudson. It drains extensive portions of the southeast slope of the Adirondack region as well as a portion of the plateau lying north of Mohawk river and south of the Adirondack mountains. The headwaters of the stream rise in the slopes surrounding Lake Pleasant, Sacandaga and Piseco lakes. It is formed by three principal branches, which unite in the southeastern part of Hamilton county. The west branch is the outlet at Piseco lake, the middle branch is the outlet of Sacandaga and Pleasant lakes, the east and principal branch issues from a series of small ponds and lakes in the southwestern part of Warren county. Sacandaga lake, the highest of the tributary lakes in the headwaters, is about 1,700 feet above mean tide. The east and middle branches unite a few miles north of Wells and are joined by the west branch a short distance below Wells. The river then flows southeasterly to a point about five miles below Northville. Above Northville the drainage basin is rugged and almost completely forest-covered. From Northville to Conklingville the stream winds through a sandy valley flanked by steep slopes. The width of this valley averages about one mile from Northampton to Conklingville. Above Northampton is an extensive flat lying at an elevation of about 740 feet. This flat is drained by Mayville, Vly and Hann's creeks and contains extensive swamp areas. From Northville to Conklingville, a distance along the general course of the stream of about 22 miles, there is very little fall. The elevation at Conklingville is about 720 feet. Sacandaga river enters Hudson river at Luzerne at elevation about 540 feet. Between Northville and the mouth of the river there is a fall of about 180 feet (chiefly concentrated in the five miles below Conklingville) entirely unutilized. There are, in fact, no power developments on the Sacandaga.

The drainage area of this river, about 1,060 square miles, is largely in forest. The mean precipitation is high, being about 49 inches, whereas the mean for the whole Hudson drainage area above Mechanicville is only about 43 inches.

SACANDAGA RIVER NEAR HOPE

Location.— About 1½ miles below the junction of east and west branches, 3¼ miles above Hope post-office, Hamilton county, and 12 miles above Northville.

Drainage area.— 494 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— September 15, 1911, to June 30, 1919.

Gage.— Staff, in two sections, the lower inclined, the upper vertical; read by Melvin Willis.

Discharge measurements.— Made from cable about 100 feet below the gage or by wading.

Channel and control.— Rocky; probably permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 7.0 feet at 7:15 A. M., April 12; discharge, 9,540 second-feet. Minimum stage recorded, 1.28 feet at 6:30 P. M., August 28, and 7:20 A. M., August 29; discharge, 37 second-feet.

1911–1919: Maximum stage recorded, 10.0 feet at 5:30 P. M., March 27, 1913; discharge, 24,800 second-feet. Minimum stage recorded, 1.17 feet at 7:55 A. M., September 30, 1913; discharge, about 20 second-feet.

Ice.— Stage-discharge relation affected by ice.

Accuracy.— Stage-discharge relation permanent; affected by ice for a large portion of the period, December to March, inclusive. Rating curve well defined between 60 and 10,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good for periods when the stage-discharge relation is not affected by ice. Results fair for other periods.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of SACANDAGA RIVER NEAR HOPE, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		Feet	Sec.-ft.
Oct. 24........	E. D. Burchard..................................	2.80	663
1919			
June 21......	C. C. Covert....................................	2.12	272

Daily gage height, in feet, of SACANDAGA RIVER NEAR HOPE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	2.20	1.69	2.70	2.23	3.90	2.90	3.25	2.70	3.25	5.20	3.70	3.05
2.....	2.22	1.66	2.25	2.18	3.80	2.70	3.30	2.60	3.60	5.20	4.70	2.80
3.....	2.12	1.64	1.88	2.12	3.70	2.75	3.80	2.46	3.50	5.20	4.60	2.65
4.....	2.08	1.59	1.68	2.02	3.60	2.75	3.70	2.44	3.40	5.30	4.50	2.48
5.....	2.02	1.55	1.68	1.96	3.60	2.70	3.50	2.41	3.40	5.50	4.40	2.35
6.....	1.99	1.56	1.95	1.90	4.70	2.50	3.30	2.40	3.90	5.60	4.40	2.50
7.....	2.00	1.54	1.82	1.86	6.00	2.45	3.20	2.38	4.00	5.60	4.50	2.45
8.....	1.98	1.51	1.78	1.82	5.40	2.40	3.15	2.37	3.80	5.60	4.30	2.31
9.....	1.98	1.84	1.75	1.78	5.10	2.37	3.10	2.36	3.80	5.80	4.20	2.26
10.....	2.22	1.78	1.74	1.72	4.80	2.34	3.10	2.34	3.90	5.80	4.00	2.22
11.....	2.12	1.74	1.85	1.68	4.10	2.45	3.05	2.32	4.00	5.80	4.10	2.16
12.....	2.12	1.72	1.90	1.58	3.90	2.60	3.00	2.30	4.10	6.80	4.10	2.13
13.....	2.08	1.68	1.91	1.52	3.80	2.65	2.95	2.28	4.20	5.50	4.00	2.10
14.....	2.38	1.62	1.98	1.52	3.70	3.25	2.90	2.26	4.20	4.70	3.90	2.08
15.....	2.31	1.59	1.96	1.62	3.60	3.70	2.90	2.26	4.30	4.50	3.80	2.28
16.....	2.28	1.56	1.88	1.75	3.50	3.40	2.90	2.28	4.40	4.50	3.80	2.22
17.....	2.24	1.52	1.88	1.72	3.50	2.95	2.85	2.32	4.50	4.40	3.90	2.16
18.....	2.19	1.50	2.05	1.70	4.00	2.85	2.80	2.38	4.60	4.30	4.60	2.14
19.....	2.12	1.48	2.02	1.85	4.10	2.85	2.80	2.40	4.60	4.30	4.40	2.09
20.....	2.08	1.44	2.02	2.25	4.00	2.80	2.75	2.45	4.60	4.20	4.30	2.06
21.....	2.02	1.43	2.20	3.00	3.80	2.75	2.80	2.48	4.70	4.00	4.20	2.02
22.....	1.98	1.41	2.26	2.90	3.60	3.00	2.90	2.50	5.30	3.80	4.20	1.96
23.....	1.90	1.39	2.30	2.80	3.50	4.60	3.10	2.50	5.80	3.70	4.20	1.92
24.....	1.84	1.36	2.24	3.15	3.40	4.50	3.30	2.50	5.70	3.70	4.60	1.82
25.....	1.78	1.34	2.20	4.20	3.10	5.10	3.60	2.55	5.70	3.80	4.60	1.78
26.....	1.75	1.33	2.20	4.20	2.70	4.60	3.25	2.50	5.60	3.60	4.40	1.90
27.....	1.70	1.31	2.16	4.70	2.65	4.10	3.10	2.50	5.50	3.60	4.30	1.96
28.....	1.70	1.29	2.21	4.90	2.70	3.80	3.00	2.45	5.20	3.50	3.80	1.92
29.....	1.67	1.30	2.25	4.50	2.95	3.60	2.90	......	5.10	3.50	3.60	1.88
30.....	1.72	1.36	2.28	4.10	3.25	3.50	2.80	......	5.10	3.40	3.40	1.82
31.....	1.74	1.34	......	4.00	......	3.50	2.80	......	5.20	......	3.20	......

Daily discharge, in second-feet, of SACANDAGA RIVER NEAR HOPE, for the year ended June 30, 1919.

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	310	114	590	......	1,150	740	1,060	590	1,060	4,230	1,560	865
2	320	106	335	......	1,150	590	1,110	525	1,440	4,230	3,130	660
3	273	101	175	......	1,150	625	1,680	438	1,330	4,280	2,930	558
4	255	89	111	......	1,150	625	1,560	432	1,220	4,480	2,740	454
5	230	81	111	......	1,150	590	1,330	416	1,220	4,990	2,560	385
6	217	83	202	......	1,150	465	1,110	410	1,810	5,250	2,560	465
7	221	79	154	......	1,150	438	1,010	400	1,940	5,250	2,390	438
8	218	73	141	......	1,150	410	960	395	1,680	5,250	2,390	365
9	213	161	132	......	1,150	395	910	390	1,680	5,250	2,230	340
10	320	141	128	......	1,150	380	910	380	1,810	5,250	1,940	320
11	273	128	164	......	1,150	438	865	370	1,940	5,790	2,080	292
12	273	122	182	......	1,150	525	820	360	2,080	8,830	2,080	278
13	255	111	186	......	1,150	558	780	350	2,230	4,990	1,940	264
14	400	96	218	......	1,150	1,060	740	340	2,230	3,130	1,810	255
15	365	89	205	......	1,150	1,560	740	335	2,390	2,930	1,680	350
16	350	83	175	......	1,150	1,220	740	350	2,560	2,740	1,680	320
17	330	75	175	......	1,330	780	700	370	2,740	2,560	1,810	292
18	305	71	242	......	1,940	700	660	400	2,930	2,390	2,930	282
19	273	68	230	......	2,080	700	660	410	2,930	2,390	2,560	260
20	235	61	230	......	1,940	660	625	438	2,930	2,230	2,390	247
21	230	59	310	......	1,680	625	660	454	3,130	1,940	2,230	230
22	213	56	340	......	1,440	820	740	465	4,480	1,680	2,230	205
23	182	52	360	......	1,330	2,990	910	465	5,790	1,560	2,230	190
24	161	48	330	......	1,220	2,740	1,440	525	5,520	1,560	2,930	154
25	141	45	310	......	910	3,990	1,440	495	5,520	1,680	2,930	141
26	132	44	310	......	590	2,930	1,060	465	5,250	1,440	2,560	182
27	116	40	292	......	558	2,080	910	465	4,990	1,330	2,080	205
28	116	38	315	......	590	1,680	820	488	4,230	1,330	1,680	190
29	108	39	335	......	780	1,440	740	......	3,990	1,330	1,440	175
30	122	48	350	......	1,060	1,330	660	......	3,990	1,220	1,220	154
31	128	45	......	......	......	1,330	660	......	4,230	......	1,010	......
Mean	235	78.9	244	600	1,190	1,140	936	424	2,940	3,380	2,190	317

NOTE. — Monthly discharge estimated for October by comparison with Hadley station on basis of drainage areas. Discharge estimated November 1-16 as 1,150 second-feet. Daily gage height for these periods probably inaccurate.

Monthly discharge of SACANDAGA RIVER NEAR HOPE, for the year ended June 30, 1919

[Drainage area, 494 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	400	108	235	0.476	0.55
August	161	38	78.9	0.160	0.18
September	590	111	244	0.494	0.55
October	....	....	600	1.21	1.40
November	....	....	1,190	2.41	2.69
December	3,990	380	1,140	2.31	2.66
January	1,680	625	936	1.89	2.18
February	590	335	424	0.860	0.90
March	5,790	1,060	2,940	5.95	6.86
April	8,830	1,220	3,380	6.84	7.63
May	3,130	1,010	2,190	4.43	5.11
June	865	141	317	0.64	0.71
The year	....	....	1,140	2.31	31.42

SACANDAGA RIVER AT HADLEY

Location.— About ½ mile west of railroad station at Hadley, Saratoga county, 1 mile above mouth of river and 4½ miles below site of proposed storage dam at Conklingville.

Drainage area.— 1,060 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— January 1, 1911, to June 30, 1919. September 13, 1907, to December 31, 1910, at upper bridge station; September 24, 1910, to midsummer of 1911, at lower bridge station.

Gage.— Gurley repeating hydrograph water-stage recorder in a concrete shelter on the left bank about ½ mile west of railroad station at Hadley.

This recorder was installed January 6, 1916, replacing a Barrett and Lawrence recorder. Recorder inspected by J. F. Kelly.

Discharge measurements.— Made from a cable about 30 feet above the gage or by wading under the cable or about ¾ mile above gage.

Channel and control.— Very rough but permanent.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 8.30 feet at 5 P. M., April 13; discharge, 11,900 second-feet. Minimum stage from water-stage recorder, 2.36 feet at 10 P. M., August 28; discharge, 92 second-feet.

1911–1919: Maximum stage from water-stage recorder, 12.36 feet from 11 A. M. to 12 noon, March 28, 1913; discharge, about 35,500 second-feet. Minimum stage from water-stage recorder, 2.25 feet, all day September 15, 1913; discharge, about 61 second-feet.

Ice.— Stage-discharge relation not affected by ice.

Accuracy.— Stage-discharge relation permanent; affected by ice during a large part of period from December to March, inclusive. Rating curve well defined between 150 and 20,000 second-feet. Operation of water-stage recorder satisfactory throughout the year. Daily discharge ascertained by applying to the rating table mean daily gage heights determined by inspecting gage height graph. Results excellent for periods when the stage-discharge relation is not affected by ice. Results fairly good for other periods.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of SACANDAGA RIVER AT HADLEY, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 11	J. W. Moulton	3.29	607
July 11	J. W. Moulton	3.31	599
1919			
Jan. 16	E. D. Burchard	4.09	1,270

Daily gage height, in feet, of SACANDAGA RIVER NEAR HADLEY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	3.28	2.77	*a*	4.41	6.2	4.5	5.1	4.03	*a*	6.85	4.95	4.5
2	3.37	2.77	*a*	4.16	6.35	*a*	5.2	3.90	4.01	6.45	5.7	4.3
3	3.52	2.73	3.29	3.99	6.15	4.10	5.5	3.81	4.30	6.1	6.15	4.1
4	3.42	2.71	3.03	3.93	5.85	4.20	5.45	3.75	4.49	5.85	6.3	3.93
5	3.30	2.68	2.86	3.74	5.55	4.20	5.05	3.70	4.6	5.8	6.25	3.8
6	3.23	2.66	2.84	3.88	5.3	4.07	4.7	3.68	4.85	5.9	6.2	3.67
7	3.16	2.65	2.89	4.36	5.0	3.85	4.6	3.61	5.1	6.05	6.1	3.60
8	3.20	2.62	3.04	4.44	4.8	3.89	4.55	3.57	5.15	6.35	6.05	3.55
9	3.15	2.71	2.96	4.32	4.55	4.01	4.57	3.50	5.25	6.6	6.0	3.60
10	3.16	2.80	2.85	4.13	4.45	4.17	4.45	3.53	5.7	6.85	5.8	3.71
11	3.30	2.92	2.78	3.96	4.40	4.90	4.25	*a*	5.8	7.1	5.75	3.72
12	3.39	2.91	2.73	3.84	4.30	3.90	4.17	*a*	5.85	7.6	5.9	3.65
13	3.45	2.89	2.72	3.72	4.18	3.92	4.08	3.48	5.9	8.2	6.05	3.54
14	3.56	2.86	2.80	3.65	4.13	3.94	4.08	3.36	5.6	8.1	6.0	3.45
15	3.84	2.82	2.96	3.60	4.05	4.20	4.08	3.41	5.4	7.5	5.85	3.41
16	3.93	2.76	3.00	3.54	3.99	4.85	4.10	3.52	5.2	7.0	5.6	3.76
17	3.81	2.71	2.94	3.46	3.93	5.1	4.11	*a*	4.9	6.75	5.4	3.91
18	3.80	2.70	2.93	3.48	*a*	5.0	3.93	3.75	5.1	6.6	5.5	3.98
19	3.82	2.63	3.13	3.52	5.55	4.75	3.89	*a*	5.6	6.45	5.75	3.79
20	3.68	2.60	3.32	3.47	5.75	4.48	3.89	*a*	5.95	6.2	5.7	3.56
21	3.51	2.56	3.48	3.85	5.7	4.33	3.80	3.49	6.3	5.95	5.55	3.40
22	3.37	2.53	3.62	4.55	5.5	4.30	3.78	3.34	*a*	5.7	5.8	3.26
23	3.21	2.52	3.62	4.55	5.25	*a*	3.75	3.32	6.8	5.45	6.35	3.17
24	3.12	2.50	3.48	4.43	5.0	5.6	*a*	3.30	6.85	5.3	6.6	3.06
25	3.08	2.49	3.41	4.24	4.7	5.9	4.6	3.35	6.85	5.35	6.75	3.00
26	3.06	2.46	*a*	4.10	4.46	6.8	4.8	3.30	6.75	5.35	6.7	2.95
27	2.98	2.44	*a*	4.23	4.09	6.9	4.7	3.37	6.65	5.25	6.45	2.95
28	2.87	2.39	5.3	4.35	4.10	6.55	4.55	*a*	7.2	5.05	6.15	*a*
29	2.84	2.39	5.05	4.28	4.31	6.1	4.40	......	7.3	5.0	5.8	4.45
30	2.80	2.41	4.75	4.28	4.47	5.65	4.28	......	7.2	5.0	5.35	4.00
31	2.77	2.45	......	5.4	......	5.25	4.16	......	7.1	......	4.95	......

a No record.

Daily discharge, in second-feet, of SACANDAGA RIVER AT HADLEY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	539	250	214	1,660	5,210	1,800	2,780	1,190	865	6,980	2,520	1,800
2	601	250	631	1,340	5,600	1,290	2,960	1,060	1,170	5,800	3,900	1,520
3	714	232	545	1,150	5,080	1,270	3,560	966	1,520	4,950	5,080	1,270
4	637	222	383	1,090	4,340	1,390	3,460	910	1,780	4,340	5,470	1,090
5	552	210	292	981	3,600	1,390	2,690	804	1,950	4,220	5,340	956
6	506	201	283	1,040	3,150	1,240	2,110	847	2,350	4,460	5,210	838
7	461	197	307	1,600	2,600	1,010	1,950	787	2,780	4,820	4,950	778
8	486	184	380	1,710	2,270	1,040	1,880	745	2,870	5,600	4,820	738
9	465	222	344	1,540	1,880	1,170	1,900	698	3,060	6,270	4,700	778
10	461	263	288	1,310	1,720	1,350	1,720	722	3,990	6,980	4,220	873
11	552	323	254	1,120	1,650	1,240	1,450	869	4,220	7,740	4,100	882
12	615	317	232	996	1,520	1,060	1,350	801	4,340	9,370	4,460	821
13	680	307	227	882	1,370	1,080	1,250	683	4,460	11,500	4,820	730
14	746	292	263	821	1,310	1,100	1,250	594	3,770	11,100	4,700	660
15	966	273	344	778	1,220	1,390	1,250	630	3,350	9,030	4,340	639
16	1,090	245	366	730	1,150	2,350	1,270	714	2,960	7,430	3,770	919
17	966	222	334	668	1,090	2,780	1,280	939	2,430	6,700	3,350	1,070
18	956	218	328	683	1,630	2,600	1,090	910	2,780	6,270	3,560	1,140
19	976	189	443	714	3,660	2,190	1,040	917	3,770	5,860	4,100	947
20	847	176	566	675	4,100	1,770	1,040	824	4,580	5,210	3,990	746
21	706	161	683	1,010	3,990	1,560	956	690	5,470	4,580	3,660	622
22	601	149	795	1,880	3,560	1,520	938	580	6,160	3,990	4,220	526
23	493	146	795	1,880	3,060	2,640	910	566	6,840	3,460	5,600	467
24	436	138	688	1,700	2,600	3,770	1,430	552	6,980	3,150	6,270	401
25	412	135	630	1,440	2,110	4,460	1,950	587	6,980	3,250	6,700	366
26	401	124	1,040	1,270	1,740	6,840	2,270	552	6,700	3,250	6,550	339
27	355	118	2,840	1,430	1,260	7,130	2,110	601	6,410	3,060	5,860	339
28	297	101	3,150	1,580	1,270	6,140	1,880	652	8,050	2,690	5,080	1,460
29	283	101	2,680	1,490	1,530	4,950	1,650	......	8,370	2,600	4,220	1,720
30	263	107	2,190	1,400	1,760	3,880	1,490	......	8,050	2,600	3,250	1,160
31	250	121	....	3,350	......	3,060	1,340	......	7,740	......	2,520	......
Mean	591	200	751	1,290	2,570	2,470	1,750	766	4,410	5,580	4,560	886

NOTE.— Stage-discharge relation not affected by ice.

Monthly discharge of SACANDAGA RIVER AT HADLEY, for the year ended June 30, 1919

[Drainage area, 1,060 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	1,090	250	591	0.558	0.64
August	323	101	200	0.189	0.22
September	3,150	214	751	0.708	0.79
October	3,350	668	1,290	1.22	1.41
November	5,600	1,090	2,570	2.42	2.70
December	7,130	1,010	2,470	2.33	2.69
January	3,560	910	1,750	1.65	1.90
February	1,190	552	766	0.723	0.75
March	8,370	865	4,410	4.16	4.80
April	11,500	2,600	5,580	5.26	5.87
May	6,700	2,520	4,560	4.30	4.96
June	1,800	339	886	0.836	0.93
The year	11,500	101	2,152	2.03	27.66

HOOSIC RIVER

DESCRIPTION

Hoosic river has its sources on the west slope of the Hoosic mountains in Vermont and Massachusetts. Two head branches, one flowing southward, the other northward along the west slope of this range, unite at North Adams, Mass., and the stream then flows northwestward, entering the Hudson three miles north of Mechanicville. Above Buskirk the drainage basin is rugged and precipitous, the distribution of tributaries affording rapid concentration of the run-off from the steep rock slopes. The ridges are sparsely wooded. The soil in the valleys is generally firm and tenacious. The general elevation of the valley at the junction of the headwaters is 1,000 feet. Numerous dams, affording power for textile, agricultural implement and other industries, are scattered throughout the length of the stream from North Adams to Schaghticoke. The drainage basin contains no important lakes and but one storage reservoir, that at Farnum, near the head of the south branch.

HOOSIC RIVER NEAR EAGLE BRIDGE

Location.— One-half mile below Walloomsac river and 1½ miles above Owl kill and Eagle Bridge, Rensselaer county.

Drainage area.— 512 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.—August 13, 1910, to June 30, 1919. September 25, 1903, to December 31, 1908, at Buskirk, 4 miles below present station.

Gage.— Chain gage on left bank near the farm house of James Russell, about 1½ miles above Eagle Bridge, installed September 4, 1918. Gage read by Mrs. J. E. Sherman and Dennis Mironowiez.

Discharge measurements.— Made from cable half mile below gage or by wading.

Channel and control.— Gravel; somewhat shifting.

Extremes of discharge.— Current year: Maximum stage recorded, 9.45 feet at 5 P. M., March 1; discharge, about 7,920 second-feet. Minimum stage recorded, 2.1 feet at 7:30 A. M., September 8; discharge, about 50 second-feet.

1910–1919: Maximum stage not recorded, as gage used prior to August 17, 1914, could not be reached at high stages. Minimum stage recorded, 6.1 feet at 5 P. M., September 14, 1913; discharge, practically zero.

Ice.— Stage-discharge relation affected by ice.

Regulation.— Flow affected by storage on Walloomsac river and at Hoosick Falls about 2 miles above gage.

Accuracy.— Stage-discharge relation probably permanent during year; usually affected by ice during much of period, December to March, inclusive. Rating curve well defined between 75 and 7,000 second-feet. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good except for periods of low water, when semidaily gage heights may not indicate the true mean, and during periods when the stage-discharge relation is affected by ice. Results fair for the latter periods.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of HOOSIC RIVER NEAR EAGLE BRIDGE, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Sept. 4	E. D. Burchard	a 2.86	181
Sept. 4	E. D. Burchard	a 2.85	178
1919			
Apr. 11	M. H. Carson	5.69	2,160
July 4	O. W. Hartwell	2.66	146

a Observed on chain gage installed this day.

Daily gage height, in feet, of HOOSIC RIVER NEAR EAGLE BRIDGE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	3.35	2.76	3.3	4.15	4.15	3.75	4.5	4.0	7.6	a	4.0	4.2
2	3.3	2.66	3.15	3.9	4.0	3.6	6.8	3.9	5.6	a	4.0	4.1
3	3.4	2.54	2.89	3.8	3.75	3.6	5.7	4.05	4.7	a	4.4	3.8
4	2.96	2.42	2.88	3.75	3.85	3.6	5.3	4.0	4.8	a	4.2	3.8
5	3.25	2.38	2.68	3.9	4.0	3.7	5.0	3.85	4.8	a	7.0	3.6
6	3.1	2.71	2.74	4.45	3.85	3.55	a	3.8	5.3	a	5.4	3.5
7	2.68	2.55	2.56	4.7	3.9	3.45	a	3.95	4.9	a	5.2	3.5
8	3.2	2.66	2.25	4.1	3.7	3.6	a	3.75	4.6	a	5.1	3.5
9	3.1	2.81	2.48	4.05	3.75	4.2	a	3.4	4.6	a	5.0	3.4
10	3.1	2.93	2.54	3.9	3.65	3.6	a	3.75	6.2	a	5.2	3.55
11	3.35	2.74	2.58	3.7	3.6	3.4	a	3.7	5.3	5.7	5.6	3.6
12	3.25	2.72	2.38	3.55	3.7	3.6	a	3.75	4.8	6.6	5.5	3.6
13	3.35	2.71	2.62	3.7	3.7	3.5	a	3.7	4.6	6.8	5.7	3.3
14	2.99	2.70	2.40	3.9	3.6	4.4	a	3.6	4.2	5.8	5.2	3.2
15	3.55	2.65	2.28	3.8	3.45	7.0	a	3.7	4.1	5.5	4.8	3.25
16	3.0	2.64	2.55	3.6	3.5	5.9	a	3.25	4.2	5.2	4.6	3.4
17	3.2	2.60	2.64	3.5	3.3	5.2	a	3.55	4.7	5.5	4.9	3.3
18	3.3	2.31	2.65	3.5	4.1	4.8	a	3.75	5.9	5.4	6.5	3.65
19	3.2	2.37	2.90	3.45	5.8	4.4	a	3.5	5.9	5.1	5.3	3.6
20	3.05	2.66	2.96	3.2	5.3	4.3	a	3.35	5.4	4.9	5.3	3.6
21	2.88	2.70	3.8	4.05	4.9	4.2	a	3.35	5.9	4.8	5.1	3.05
22	2.93	2.64	3.95	4.0	4.9	4.15	a	3.3	a	4.6	6.8	3.4
23	2.82	2.44	3.5	3.8	4.7	6.3	a	3.0	a	4.4	6.5	3.2
24	2.82	2.30	3.2	3.55	4.4	5.3	5.5	3.1	a	4.5	5.7	3.05
25	2.66	2.45	3.4	3.4	4.4	6.2	4.6	3.15	a	4.5	5.5	3.3
26	2.72	2.52	5.3	3.6	4.3	5.7	4.4	4.7	a	4.2	5.5	2.85
27	2.70	2.63	6.5	3.35	3.9	5.1	4.45	3.75	a	4.2	5.2	3.0
28	2.41	2.50	4.9	3.65	3.7	4.9	4.2	3.7	a	4.4	4.8	3.7
29	2.55	2.60	4.2	3.4	3.95	4.4	4.2	......	a	4.2	4.7	3.15
30	2.65	2.65	4.1	3.5	3.9	4.2	4.15	......	a	4.0	4.4	2.92
31	2.65	2.55	......	4.25	......	4.35	4.0	......	a	......	4.2	......

a No record.

Daily discharge, in second-feet, of HOOSIC RIVER NEAR EAGLE BRIDGE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	340	155	320	765	765	528	1,020	670	4,750	......	670	800
2.....	320	132	268	610	670	450	3,590	610	2,100	......	670	720
3.....	360	108	188	555	528	450	2,210	700	1,190	......	940	555
4.....	208	88	185	528	582	450	1,770	670	1,280	......	800	555
5.....	302	82	136	610	670	500	1,470	582	1,280	......	3,870	450
6.....	250	142	150	980	582	428	1,400	555	1,770	......	1,880	405
7.....	136	110	112	1,190	610	382	950	640	1,370	......	1,670	405
8.....	285	132	65	730	500	450	800	528	1,100	......	1,670	405
9.....	250	168	97	700	528	800	750	360	1,100	......	1,470	360
10.....	250	199	108	610	475	450	750	528	2,810	......	1,670	428
11.....	340	150	116	500	450	360	750	500	1,770	2,210	2,100	450
12.....	302	145	82	428	500	450	......	528	1,260	3,320	1,990	450
13.....	340	142	124	500	500	405	......	500	1,100	3,590	2,210	320
14.....	217	140	85	610	450	940	......	450	800	2,330	1,670	285
15.....	428	130	68	555	382	3,870	......	500	730	1,990	1,280	302
16.....	220	128	110	450	405	2,450	......	302	800	1,670	1,100	360
17.....	285	120	128	405	320	1,670	......	428	1,190	1,990	1,370	320
18.....	320	72	130	405	730	1,280	......	528	2,450	1,880	3,190	475
19.....	285	80	190	382	2,330	940	......	405	2,450	1,570	1,770	450
20.....	235	132	208	285	1,770	870	......	340	1,880	1,370	1,770	450
21.....	185	140	555	700	1,370	800	750	340	2,450	1,280	1,570	235
22.....	199	128	640	670	1,370	765	860	320	2,400	1,100	3,590	360
23.....	170	91	405	555	1,190	2,930	1,100	220	2,280	940	3,190	285
24.....	170	70	285	428	940	1,770	1,090	250	2,200	1,020	2,210	235
25.....	132	92	360	360	940	2,810	1,100	268	2,200	1,020	1,990	320
26.....	145	104	1,770	450	670	2,210	940	1,190	2,200	890	1,990	178
27.....	140	126	3,190	340	610	1,570	980	528	2,400	800	1,670	220
28.....	86	100	1,370	475	560	1,370	800	500	2,600	940	1,280	500
29.....	110	120	800	360	640	940	800	......	2,800	800	1,190	268
30.....	130	130	730	405	610	800	765	......	2,400	670	940	196
31.....	130	110	......	835	......	905	670	......	2,090	......	800	......
Mean...	235	121	432	560	760	1,130	1,050	498	1,910	1,710	1,740	392

NOTE.— Discharge, September 4 to 30, determined from gage heights observed on new chain gage. Discharge estimated, because of no record, January 6 to 23 and March 22 to April 10, from comparison with Schroon river at Riverbank and Sacandaga river at Hadley and study of discharge hydrograph.

Monthly discharge of HOOSIC RIVER NEAR EAGLE BRIDGE, for the year ended June 30, 1919

[Drainage area, 512 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	428	86	235	0.459	0.53
August	199	70	121	0.236	0.27
September	3,190	65	432	0.844	0.94
October	1,190	285	560	1.09	1.26
November	2,330	320	760	1.48	1.65
December	3,870	360	1,130	2.21	2.55
January	3,590	670	1,050	2.05	2.36
February	1,190	220	498	0.973	1.01
March	4,750	730	1,910	3.73	4.30
April	3,590	670	1,710	3.34	3.73
May	3,870	670	1,740	3.40	3.92
June	800	178	392	0.766	0.85
The year	4,750	65	878	1.71	23.37

HOOSIC RIVER AT SCHAGHTICOKE

Location.— At the dam of the Schaghticoke power-plant of the Schenectady Power Company located at the highway bridge at Schaghticoke on the Hoosic river about 6½ miles above its confluence with the Hudson river. The power-plant is about 1 mile below the dam and connected therewith by a canal and steel penstock.

Drainage area.— 635 square miles.

Records available.—December 1, 1908, to June 30, 1919.

Gage.— Indicating water-surface above dam, consists of a float operating contacts, which by voltage drop indicates in the power-house the water-surface. Gage in the forebay at end of canal is a staff gage graduated to tenths.

Control.—Discharge estimates based on the flow over the dam and the flow through the wheels estimated from hourly readings reduced by curves furnished by water-wheel manufacturers, based upon tests after installation. There are 4 radial inward flow Francis type wheels manufactured by Pelton, each 5,000 hp.

Extremes of discharge.—Current year: Maximum mean daily discharge recorded, 7,598 second-feet on May 23. Minimum mean daily discharge recorded, 0 second-feet on July 4.

1908–1919: Maximum stage recorded, approximately 25,000 second-feet, February 6, 1909. Minimum stage recorded, 0 second-feet on a number of days, due to interruption of flow by plants farther upstream.

Regulation.—During low stages discharge appreciably affected by local storage at power-plants above station.

Coöperation.—Established and maintained by the Schenectady Power Company, discharge reduced and furnished by Mr. E. B. Doen, Superintendent, Schaghticoke, N. Y.

Daily discharge, in second-feet, of HOOSIC RIVER AT SCHAGHTICOKE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan	Feb.	Mar.	April	May	June
1.....	339	111	428	819	723	430	656	549	3,550	1,768	400	2,479
2.....	274	64	220	662	546	467	867	362	2,072	1,528	869	509
3.....	310	74	185	504	487	542	737	469	1,435	1,596	874	1,395
4.....	0	70	89	504	562	514	464	500	1,248	1,794	890	834
5.....	244	31	57	568	662	443	414	475	1,401	2,549	2,400	563
6.....	337	50	100	1,200	640	286	1,149	414	1,681	3,060	1,403	480
7.....	121	115	93	1,031	795	409	1,161	372	1,271	3,028	1,420	444
8.....	281	127	94	743	587	428	1,154	442	1,214	2,628	1,026	193
9.....	174	127	127	663	466	674	1,135	185	1,649	2,510	1,783	506
10.....	268	173	40	604	474	421	875	307	1,960	2,149	1,595	450
11.....	335	62	71	506	539	421	843	231	1,606	2,001	3,062	400
12.....	335	150	57	451	317	466	425	293	1,200	3,750	2,171	326
13.....	384	115	34	553	468	462	705	323	1,610	2,460	2,876	292
14.....	243	104	70	613	413	1,284	853	417	1,045	1,398	2,614	318
15.....	451	78	10	466	298	1,347	815	419	879	1,943	1,667	100
16.....	236	55	104	646	370	1,609	689	243	692	1,549	1,270	327
17.....	245	115	34	317	324	1,233	611	307	1,477	1,980	3,255	270
18.....	300	55	132	330	1,364	1,021	733	269	1,999	1,568	6,610	270
19.....	407	80	173	369	2,091	1,023	566	169	2,284	1,278	6,036	175
20.....	349	70	225	347	1,503	800	700	267	1,961	1,211	4,850	202
21.....	196	69	723	722	1,217	819	495	285	2,110	1,185	3,506	130
22.....	141	80	510	532	1,066	783	646	217	2,080	735	4,811	187
23.....	207	70	289	502	965	901	1,064	196	1,757	850	7,598	241
24.....	164	46	219	403	552	950	2,080	368	1,583	867	6,650	209
25.....	183	100	430	459	762	474	731	450	1,274	721	6,465	186
26.....	130	57	1,750	478	473	736	920	1,263	1,176	596	5,601	185
27.....	118	81	1,332	266	621	491	1,117	472	1,145	633	5,017	418
28.....	138	70	870	514	487	551	889	774	2,954	588	2,854	498
29.....	3	115	518	400	717	350	790	......	2,184	764	1,793	93
30.....	100	115	713	646	623	687	848	......	2,129	718	1,689	204
31.....	138	266	......	874	......	754	680	......	2,247	......	3,115	......
Mean...	230	93	323	570	703	702	832	394	1,705	1,646	3,102	429

Monthly discharge of HOOSIC RIVER AT SCHAGHTICOKE, for the year ended June 30, 1919

[Drainage area, 635 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	451	0	230	0.362	0.42
August	266	31	93	0.146	0.17
September	1,750	10	323	0.509	0.57
October	1,200	266	570	0.898	1.04
November	2,091	298	703	1.107	1.24
December	1,609	286	702	1.106	1.28
January	2,080	414	832	1.310	1.51
February	1,263	169	394	0.620	0.65
March	3,550	692	1,705	2.685	3.10
April	3,750	588	1,646	2.592	2.89
May	7,598	400	3,102	4.885	5.63
June	2,479	93	429	0.676	0.75
The year	7,598	0	894	1.408	19.25

MOHAWK RIVER

DESCRIPTION

Mohawk river, the largest tributary of the Hudson, rises in the sandy hills south of Boonville, in central New York, about 40 miles from the east end of Lake Ontario. Its uppermost tributaries are fed by large springs. The river receives also considerable water brought in from the adjacent Black river drainage basin for the supply of Black River and Erie canals. The Mohawk flows southward until it reaches the city of Rome, at which point it turns toward the east, flowing across the state in a course nearly east until it enters the Hudson at Cohoes opposite North Troy. Its total length is about 140 miles and its drainage area comprises 3,486 square miles.

The immediate valley of the Mohawk is broad and open, at many places a mile or two in width, and the flats which border the stream have a rich alluvial soil, finely adapted to the raising of grass, grains and broom corn. Back of the flats there is a rise, usually gradual, but in certain localities more or less abrupt, to hills which attain altitudes several hundred feet above the stream. The more elevated lands are covered with sandy and gravelly loam. Toward the mouth of the river the valley becomes contracted and the meadows disappear.

Above Rome the Mohawk flows through a deep gorge in shale rock. From Rome eastward to Little Falls the valley is deeply filled with alluvial deposits and the flood plains on either side become submerged during freshets, thus acting to some extent as storage reservoirs. At Little Falls the river cuts through a rocky gorge, whose walls rise precipitously 500 or 600 feet.

The Erie canal ran parallel to the Mohawk through most of its course below Rome and derived a part of its water-supply from the river. Feeder dams for purposes of diversion for the supply of the Black River and old Erie canals were located on the river at Delta, Rome, Little Falls, Rocky Rift and Rexford. A dam at Oriskany creek also diverted into the canal a portion of the flow of that tributary, as well as waters brought into the Mohawk basin from storage reservoirs located in the upper drainage basin of Chenango river near Hamilton. There was also a

diversion at the dam near the mouth of Schoharie creek, the largest tributary of the Mohawk.

The new Barge canal utilizes by canalization the greater portion of the river below Utica. The Barge canal leaves the north fork of the Mohawk river just above its junction with the Hudson river, where a low navigable surface at Elev. 15.2 is maintained by the Federal dam at Troy. The canal rises through five locks and reënters the river just above the new Crescent dam (dam No. 2), which is a curved concrete structure in two sections with an ogee crest totaling 1,486.2 feet at Elev. 184.0, final closure of which was made May 10, 1915, but by opening head-gates at the west end of the dam, the water-surface was kept below the crest until July 1, 1915, when gates were closed and first flow over the completed crest occurred. The head-gates were again opened from Oct. 11 to Dec. 4, 1915. This dam is about three-quarters of a mile above and is reached by the pool formed by the power dam of the Cohoes Company at Cohoes, the fixed crest of which was raised from an average elevation of 154.2 to about Elev. 157.0 in the summer of 1914. The pool formed by the Crescent dam extends about 10.2 miles upstream to the Vischer Ferry dam and submerges the old Dunsbach Ferry dam located about 4.6 miles upstream and which was partially removed during August, 1912.

The new Vischer Ferry dam (dam No. 3), final closure of which was made June 9, 1913, is a concrete structure with an ogee crest having a broken trace composed of three straight sections, of lengths, from south to north, of 735.2, 681.8 and 501.7, a total of 1,918.7 feet. The middle section is a low weir on an island cut down to Elev. 210.0 above the weir and somewhat lower below. This dam maintains a pool with a low navigable surface at crest elevation 211.0 about 10.9 miles in length and submerges the old State dam at Rexford about 4.3 miles upstream, which had a crest 675 feet long at Elev. 209.5.

Between Schenectady and St. Johnsville there are eight movable dams of the Boulé gate and bridge type. During the winter and during flood stages the gates and their supports are raised, leaving, except for either one or two piers, a channel entirely unobstructed and of an area practically equivalent to that existing at that point before the construction of the dam. The location of

these dams, clear span of openings, elevation of sill and pool, *i. e.* low water-surface to be maintained above dam during navigation season, and length of canalized pool above are as follows:

Scotia dam (No. 4) about three miles above the N. Y. C. R. R. bridge at Schenectady, openings 150–210–150 feet, sill Elev. 209.0, pool Elev. 225.0, 5 miles long.

Rotterdam dam (No. 5) about one and nine-tenths miles above the Boston & Maine bridge at Rotterdam Junction, openings 150–210–150 feet, sill Elev. 220.0, pool Elev. 240.0, 6 miles long.

Cranesville dam (No. 6) three and two-tenths miles below the Amsterdam–South Amsterdam highway bridge, openings 150–180–150 feet, sill Elev. 235.0, pool Elev. 255.0, 4.3 miles long.

Amsterdam dam (No. 7) one and one-tenth miles above the Amsterdam–South Amsterdam highway bridge, openings 180–210–180 feet, sill Elev. 247.0, pool Elev. 267.0, 4.3 miles long.

Tribes Hill dam (No. 8) just above the Tribes Hill–Fort Hunter highway bridge and just below the mouth of Schoharie creek, openings 240–240 feet, sill Elev. 262.0, pool Elev. 278.0, 9.6 miles long.

Yosts dam (No. 9) nine-tenths of a mile below the village of Yosts, openings 180–180 feet, sill Elev. 268.0, pool Elev. 286.0, 7.8 miles long.

Canajoharie dam (No. 10) about one-third mile above the Canajoharie–Palatine Bridge highway bridge, openings 210–210 feet, sill Elev. 276.0, pool Elev. 294.0, 3.4 miles long.

Fort Plain dam (No. 11) four-tenths of a mile above Fort Plain–Nelliston highway bridge, openings 210–210 feet, sill Elev. 284.0, pool Elev. 302.0, 6.6 miles long.

Although the above movable dams had been previously completed and operated to facilitate dredging operations, this portion of the canal was not opened to navigation until May, 1916.

From below new Barge canal lock No. 16, about one and four-tenths miles above St. Johnsville, to above the old Rocky Rift feeder dam the canal follows a land-line. Opposite lock No. 16, at the end of the river dredging, the natural bed of the stream is maintained by the Mindenville retention dam, the crest of which is 300 feet long and at Elev. 300.5, a foot and a half below

the low navigable surface above the Fort Plain dam. The old Rocky Rift feeder dam (No. 12) has been raised from the old fixed crest averaging about Elev. 319.35 to Elev. 322.5, by the addition of a movable crest, consisting of steel trestles and small Boulé gates with a new fixed crest, at Elev. 319.5. The canalized pool above this dam extends to about 3,000 feet below the lower dam at Little Falls, a distance of about 3.7 miles. Castle creek enters the land-line of the Barge canal just above, or west of the Indian Castle guard-gate and flows west through the canal, entering the Mohawk river above the Rocky Rift dam.

The three existing dams at Little Falls are unchanged, the upper, or State dam (No. 13) being used to maintain the canalized river pool at Elev. 363.0 and 3.2 miles in length to Jacksonburg, where the canal enters a land-line.

The canal reënters the river just above the Mohawk street bridge at Herkimer. Immediately below this bridge a new dam (No. 14) has been constructed to retain the canalized pool to the Frankfort retention dam, a distance of 4.6 miles, and that of the land-line from Frankfort to lock No. 19 at Sterling creek at a low navigable surface of Elev. 383.0. The Herkimer dam, a needle dam 126 feet long with a sill at Elev. 374.0, except for 10.5 feet, which is at Elev. 379.0, will be superseded by a new dam, just below, of the Boulé gate and bridge type, of the same span, now under construction.

Above Frankfort several bends in the river have been cut out to provide room for the land-line to Rome, and the existing bed of the stream is retained by the Frankfort retention dam, located just above the canal terminal spur at Frankfort and about 1,600 feet upstream from the highway bridge over the river on the Dyke road between Frankfort and North Frankfort. This dam is of concrete with an ogee crest, having a broken profile as follows: 41 feet 6 inches at Elev. 381.0, flanked by two sections each 36 feet 9 inches long, at Elev. 386.0. For the passage of flood flows there is a paved crest at Elev. 389.0, 433 feet long at the north end of the concrete structure. At Rome the Mohawk river enters the summit level of the Barge canal over a new retention dam, about 400 feet north of the canal, having a concrete ogee crest 225 feet long at Elev. 427.0, and is diverted eastward along the canal prism for 3.2 miles, leaving it over a concrete

spillway with an ogee crest 225 feet long at pool Elev. 420.0. There is also another and smaller spillway with paved crest 88 feet in length at Elev. 420, about three-quarters of a mile east of where the river enters the canal. The section of the summit level utilized for the river can be cut off from the remaining portions during higher flow periods by the closure of guard-gates at each end.

The water-supply for the Rome summit level of the new canal will to a large extent come from the Mohawk. A high dam has been constructed across the Mohawk at Delta, 6 miles north of Rome, for the purpose of creating a reservoir to store water for the canal. The capacity is 2,750,000,000 cubic feet. This supply will be supplemented by a reservoir of 3,445,000,000 cubic feet capacity on West Canada creek at Hinckley. Hinckley water will be passed down West Canada creek and diverted by a new dam on the site of the old Morgan dam at Trenton Falls through a feeder canal to Nine-Mile creek and thence to the Barge canal.

The principal tributaries of the Mohawk below the source are, successively, Oriskany, West Canada, East Canada and Schoharie creeks.

Drainage areas of MOHAWK RIVER AND TRIBUTARIES
(From U. S. G. S. topographic maps)

LIMITS	AREA IN SQUARE MILES			
	Place to place	Sub-total	Branch total	Total
Lansingkill				
Source to junction with West branch	29.41	....	29.41	....
MOHAWK RIVER				
Source of West branch to junction with East branch	19.25	19.25	....	....
Source of East branch to junction with West branch	15.16	34.41	....	....
Junction of East and West branches to and including first large creek to north	5.86	40.27	....	....
First creek below junction to and including second large creek to north	6.08	46.35	....	....
Second creek below junction to junction of Lansingkill, Hillside	3.40	49.75	49.75	79.16
Junction at Hillside to mouth of Stringer brook	1.17	....	....	80.3
Stringer Brook				
Source to mouth	13.43	....	13.43	93.76
MOHAWK RIVER				
Junction of Stringer brook to mouth of Big brook (Frenchville)	3.02	....	....	96.78

Drainage areas of MOHAWK RIVER AND TRIBUTARIES — *Continued*
(From U. S. G. S. topographic maps)

LIMITS	AREA IN SQUARE MILES			
	Place to place	Sub-total	Branch total	Total
Big Brook				
Source to mouth	22.86	....	22.86	119.64
MOHAWK RIVER				
Junction of Big brook (Frenchville) to State feeder dam at Delta (now submerged)	16.25	....	....	135.89
State feeder dam at Delta to highway bridge below new Delta dam	11.97	....	....	147.86
Highway bridge below new Delta dam to Ridge Mills dam	7.74	....	....	155.60
Ridge Mills dam to Floyd Ave. bridge	2.59	....	....	158.19
Floyd Ave. bridge to State dam at Rome	2.55	....	....	160.74
State dam at Rome to mouth of Six-Mile creek	26.40	....	....	187.14
Six-Mile Creek (Oneida Co.)				
Source to mouth	14.94	....	14.94	202.08
MOHAWK RIVER				
Mouth of Six-Mile creek to mouth of Nine-Mile creek	5.29	....	....	207.37
Nine-Mile Creek				
Source to South Trenton	19.62	....	....	....
South Trenton to crossing of 700-foot contour	6.54	26.16	....	....
Crossing of 700-foot contour to first bridge above Holland Patent	2.49	28.65	....	....
First bridge above Holland Patent to first bridge below Holland Patent	12.71	41.36	....	....
First bridge below Holland Patent to Stittville	6.12	47.48	....	....
Stittville to first bridge below Stittville (Powell's bridge)	11.59	59.07	....	....
Powell's bridge to third bridge below Stittville	10.34	69.41	....	....
Third bridge below Stittville to mouth	0.79	70.20	70.20	277.57
MOHAWK RIVER				
Mouth of Nine-Mile creek to mouth of Oriskany creek	6.19	....	....	283.76
Areas diverted from Chenango river basin *				
Chenango river from source to junction with Eaton brook at Eaton	25.25	....	....	25.25
Eaton brook from source to Eaton reservoir dam	9.16	9.16	....	....
Eaton reservoir dam to junction with Chenango river at Eaton	6.69	15.85	15.85	41.10
Chenango river, junction Eaton brook to head of feeder canal	2.99	....	....	44.09
Bradley brook from source to Bradley reservoir dam	3.04	....	....	....
Bradley reservoir dam to head of feeder canal	4.57	7.61	....	....
Kingsley brook from source to Kingsley reservoir dam	5.12	....	....	....
Kingsley reservoir dam to junction with Bradley brook feeder canal	1.75	6.87	14.48	58.57
Header of feeder, Chenango river to junction of feeders, Woodman pond	2.04	....	....	60.61
Payne brook from source to Madison reservoir dam	8.73	....	....	....
Madison reservoir dam to junction of feeders, Woodman pond	2.04	10.77	10.77	71.38
Junction of feeders, Woodman pond to junction with Leland pond outlet	3.26	....	....	74.64
Source, Leland creek to canal reservoir dam	6.74	....	....	81.38
Junction with Leland pond outlet to natural watershed limits	6.53	....	....	87.91

* Not included in totals for Mohawk river areas.

Drainage areas of MOHAWK RIVER AND TRIBUTARIES — *Continued*
(From U. S. G. S. topographic maps)

LIMITS	Area in Square Miles			
	Place to place	Sub-total	Branch total	Total
Oriskany Creek				
Source of Oriskany creek to bridge at Solsville...	7.84	....	....	....
Solsville to Oriskany Mills....................	13.27	21.11	....	....
Oriskany Mills to junction with Big creek, Oneida county (Deansboro)....................	16.54	37.65	....	....
Source of Big creek to junction with Oriskany creek (Deansboro)....................	20.32	57.97	....	....
Junction with Big creek to Farmers Mills.......	14.09	72.06	....	....
Farmers Mills to Clinton....................	11.11	83.17	....	....
Clinton to Kirkland....................	4.73	87.90	....	....
Kirkland to dam above Clark Mills...........	5.76	93.66	....	....
Dam above Clark Mills to Walesville...........	9.92	103.58	....	....
Walesville to Colemans....................	36.99	140.57	....	....
Colemans to State dam above Oriskany.........	5.47	146.04	....	....
State dam above Oriskany to mouth of Oriskany creek....................	0.78	146.82	146.82	430.58
MOHAWK RIVER				
Mouth of Oriskany creek to mouth of Sauquoit creek....................	15.68	....	....	446.26
Sauquoit Creek				
Source of Sauquoit creek to Cassville...........	7.17	....	....	....
Cassville to dam at Clayville....................	4.71	11.88	....	....
Dam at Clayville to dam at Sauquoit...........	12.54	24.42	....	....
Dam at Sauquoit to dam above Chadwick.......	4.28	28.70	....	....
Dam above Chadwick to 700-foot contour at Willowvale....................	3.72	32.42	....	....
700-foot contour at Willowvale to dam at Washington Mills....................	11.37	43.79	....	....
Dam at Washington Mills to dam above New Hartford....................	2.92	46.71	....	....
Dam above New Hartford to dam at Capron....	1.52	48.23	....	....
Dam at Capron to dam below Capron..........	2.20	50.43	....	....
Dam below Capron to upper dam at New York Mills....................	0.49	50.92	....	....
Upper dam at New York Mills to mouth of Sauquoit creek....................	14.58	65.50	65.50	511.76
MOHAWK RIVER				
Mouth of Sauquoit creek to Black River R. R. bridge at Utica....................	13.09	....	....	524.85
Black River R. R. bridge at Utica to mouth of Reels creek....................	2.70	....	....	527.55
Reels Creek				
Source to mouth....................	9.69	....	9.69	537.24
Ballou Creek				
Source to mouth....................	4.57	....	4.57	541.81
MOHAWK RIVER				
Mouth of Ballou creek to mouth of Starch Factory creek....................	1.99	....	....	543.80
Starch Factory Creek				
Source to mouth....................	7.22	....	....	551.02
MOHAWK RIVER				
Mouth of Starch Factory creek to mouth of Sterling creek....................	30.93	....	....	581.95
Sterling Creek				
Source to mouth....................	19.94	....	....	601.89
MOHAWK RIVER				
Mouth of Sterling creek to mouth of Moyer creek.	14.85	....	....	616.74

Drainage areas of MOHAWK RIVER AND TRIBUTARIES — *Continued*
(From U. S. G. S. topographic maps)

LIMITS	AREA IN SQUARE MILES			
	Place to place	Sub-total	Branch total	Total
Moyer Creek				
Source to mouth	21.66	....	....	638.40
MOHAWK RIVER				
Mouth of Moyer creek to mouth of Steels creek	7.30	....	....	645.70
Steels Creek				
Source to mouth	29.54	....	....	675.24
MOHAWK RIVER				
Mouth of Steels creek to Mohawk-Herkimer road bridge	33.07	....	....	708.31
Mohawk-Herkimer road bridge to mouth of West Canada creek	7.51	....	....	715.82
West Canada Creek *				
Source to mouth	583.64	....	....	1,299.46
MOHAWK RIVER				
Mouth of West Canada creek to State dam at Little Falls	26.07	....	....	1,325.53
State dam at Little Falls to Gilberts dam	4.20	....	....	1,329.73
Gilberts dam to Rocky Rift feeder dam	11.82	....	....	1,341.55
Crum Creek				
Source to mouth	11.40	....	....	1,352.95
MOHAWK RIVER				
Mouth of Crum creek (feeder dam) to mouth of Nowadaga creek	0.27	....	....	1,353.22
Nowadaga Creek				
Source to mouth	32.43	....	....	1,385.65
MOHAWK RIVER				
Mouth of Nowadaga creek to mouth of East Canada creek	4.65	....	....	1,390.30
East Canada Creek *				
Source to mouth	a 281.81	....	....	a 1,672.11
MOHAWK RIVER				
Mouth of East Canada creek to mouth of East Crum creek	0.59	....	....	a 1,672.70
East Crum Creek				
Source to mouth	15.55	....	....	a 1,688.25
MOHAWK RIVER				
Mouth of East Crum creek to mouth of Timmerman creek	3.31	....	....	a 1,691.56
Timmerman Creek				
Source to mouth	16.38	....	....	a 1,707.94
MOHAWK RIVER				
Mouth of Timmerman creek to mouth of Zimmerman creek	0.52	....	....	a 1,708.46
Zimmerman Creek				
Source to mouth	14.63	....	....	a 1,723.09
MOHAWK RIVER				
Mouth of Zimmerman creek to St. Johnsville bridge	0.54	....	....	a 1,723.63
St. Johnsville bridge to mouth of Garoga creek	12.05	....	....	a 1,735.68

* For subareas, see separate table following. a Corrected for error of 0.2 noted in Report of State Engineer and Surveyor for 1916, Vol. II, pages 322 and 325.

Drainage areas of MOHAWK RIVER AND TRIBUTARIES — *Continued*
(From U. S. G. S. topographic maps)

LIMITS	AREA IN SQUARE MILES			
	Place to place	Sub-total	Branch total	Total
Garoga Creek				
Source of Garoga creek to foot of East Garoga lake	10.44	....	....	....
Foot of East Garoga lake to foot of pond, Newkirk Mills	3.18	13.62	....	....
Foot of pond, Newkirk Mills, to junction with Peck lake outlet	9.11	22.73	22.73	....
Source to Woodworth lake to foot of Peck lake	16.29	....	....	....
Foot of Peck lake to junction with Garoga creek	4.52	20.81	43.54	....
Junction with Peck lake outlet to Rockwood	7.20	....	50.74	....
Rockwood to Garoga	2.19	....	52.93	....
Garoga to mouth of Sprite creek	4.99	....	57.92	....
Source of Sprite creek to mouth	14.13	....	72.05	....
Mouth of Sprite creek to fourth highway bridge above mouth	13.19	....	85.24	....
Fourth highway bridge above mouth to second highway bridge above mouth	7.78	....	93.02	....
Second highway bridge above mouth to first highway bridge above mouth	1.17	....	94.19	....
First highway bridge above mouth to mouth of Garoga creek	0.51	....	94.70	*a* 1,830.38
MOHAWK RIVER				
Mouth of Garoga creek to Fort Plain	12.70	....	....	*a* 1,843.08
Fort Plain to Canajoharie	67.92	....	....	*a* 1,911.00
Canajoharie Creek				
Source to mouth	69.22	....	69.22	*a* 1,980.22
MOHAWK RIVER				
Canajoharie to Sprakers	9.94	....	....	*a* 1,990.16
Flat Creek				
Source to mouth	49.11	....	49.11	*a* 2,039.27
MOHAWK RIVER				
Sprakers to mouth of Yatesville creek	17.56	....	....	*a* 2,056.83
Yatesville Creek				
Source to mouth	12.71	....	12.71	*a* 2,069.54
MOHAWK RIVER				
Mouth of Yatesville creek to mouth of Cayadutta creek	24.48	....	....	*a* 2,094.02
Cayadutta Creek				
Source of Cayadutta creek to Johnstown (Main street bridge)	35.16	....	....	....
Johnstown (Main street bridge) to dam above Sammonsville	2.84	38.00	....	....
Dam above Sammonsville to dam at Sammonsville	3.53	41.53	....	....
Dam at Sammonsville to dam two miles below Sammonsville	16.44	57.97	....	....
Dam below Sammonsville to mouth of Cayadutta creek	5.06	63.03	63.03	*a* 2,157.05
MOHAWK RIVER				
Mouth of Cayadutta creek to Fultonville bridge	0.68	....	....	*a* 2,157.73
Fultonville bridge to mouth of Schoharie creek	47.39	....	....	*a* 2,205.12
Schoharie Creek *				
Source to mouth	*b* 929.88	....	....	*b* 3,135.00

* For subareas, see table following. *a* Corrected for error of 0.2 noted in Report of State Engineer and Surveyor for 1916, Vol. II, pages 322 and 325. *b* These areas have been revised as the result of a joint determination of drainage areas of Schoharie creek, based on independent computations by the engineers of the Board of Water Supply of the city of New York and of the Department of State Engineer, and are also corrected for the error of 0.2 noted in Report of State Engineer and Surveyor for 1916, Vol. II, pages 322 and 325.

Drainage areas of MOHAWK RIVER AND TRIBUTARIES — *Concluded*
(From U. S. G. S. topographic maps)

LIMITS	Area in Square Miles			
	Place to place	Sub-total	Branch total	Total
MOHAWK RIVER				
Mouth of Schoharie creek to mouth of Chuctanunda creek (Amsterdam)	31.54	....	....	b 3,166.54
South Chuctanunda Creek				
Source to Minaville	22.62	22.62	....	....
Minaville to mouth	10.41	33.03	33.03	b 3,195.57
North Chuctanunda Creek				
Source to dam, Amsterdam reservoir	8.76	8.76	....	....
Dam, Amsterdam reservoir to Hagaman	20.77	29.53	....	....
Hagaman to Rockton	4.11	33.64	....	....
Rockton to mouth	5.58	39.22	39.22	b 3,238.79
MOHAWK RIVER				
Amsterdam to Hoffman Ferry	43.59	....	....	b 3,282.38
Hoffman Ferry to Scotia bridge	52.44	....	....	b 3,334.82
Scotia bridge to mouth of Alplaus kill	24.37	....	....	b 3,359.19
Alplaus Kill				
Source to mouth	55.80	....	55.80	b 3,414.99
MOHAWK RIVER				
Mouth of Alplaus kill to Vischer Ferry dam	12.21	....	....	b 3,427.20
Vischer Ferry dam to Crescent dam	66.13	....	....	b 3,493.33
Crescent dam to Cohoes Co.'s dam	0.61	....	....	b 3,493.94
Cohoes Co.'s dam to mouth of Mohawk river	12.68	....	....	b 3,506.62

b These areas have been revised as the result of a joint determination of drainage areas of Schoharie creek, based on independent computations by the engineers of the Board of Water Supply of the city of New York and of the Department of State Engineer, and are also corrected for the error of 0.2 noted in Report of State Engineer and Surveyor for 1916, Vol. II, pages 322 and 325.

Drainage areas of WEST CANADA CREEK
(From U. S. G. S. topographic maps)

LIMITS	Area in Square Miles			
	Place to place	Sub-total	Branch total	Total
WEST CANADA CREEK				
Source to outlet of Mud lake	18.05	....	....	18.05
Outlet of Mud lake to Swanson dam	28.77	....	....	46.82
Swanson dam to Honnedaga brook	46.82	....	....	93.64
Honnedaga Brook				
Honnedaga lake above outlet	5.40	....	....	....
Lake to mouth	11.90	....	17.30	110.94
WEST CANADA CREEK				
Honnedaga brook to South branch	30.46	....	....	141.40
South Branch, West Canada Creek				
Source to Mountain House	34.40	....	....	....
Mountain House to mouth	19.25	....	53.65	195.05

Drainage areas of WEST CANADA CREEK — *Continued*
(From U. S. G. S. topographic maps)

LIMITS	AREA IN SQUARE MILES			
	Place to place	Sub-total	Branch total	Total
WEST CANADA CREEK				
South branch to Four-Mile brook (Wilmurt bridge)	2.58	....	....	197.63
Four-Mile Brook				
Source to mouth	....	....	26.17	223.80
WEST CANADA CREEK				
Four-Mile brook to Black creek	36.92	....	....	260.72
Black Creek				
Source through Hall Vly	8.40	....	....	....
Hall Vly to Bennett's mill (first bridge above Gray)	16.30	....	24.70	....
Bennett's mill to Gray	4.50	....	29.20	....
Gray to North branch (first bridge below Gray)	3.00	....	32.20	....
North Branch, Black Creek				
Source to Bull Hill road (contour 1,520)	6.80	....	....	....
Bull Hill road to Mill creek	4.00	10.80	....	....
Mill creek:				
Source through Cranberry lake and swamp	11.00	....	....	....
Foot of Cranberry swamp to mouth	6.20	17.20	....	....
Total, North branch, Black creek, to Mill creek, inclusive		28.00		
North Branch, Black Creek				
Mill creek to mouth	0.85	28.85	61.05	....
Black Creek				
North branch to Mounts creek	0.17	....	61.22	....
Mounts Creek				
Source to Gray-Wilmurt road (Radley)	13.25	....	....	....
Gray-Wilmurt road to mouth	2.10	15.35	76.57	....
Black Creek				
Mounts creek to second bridge below Gray	1.55	....	78.12	....
Second bridge to third bridge below Gray	5.65	....	83.77	....
Third bridge to fourth bridge below Gray	12.35	....	96.12	....
Fourth bridge to Pardeville bridge	4.00	....	100.12	....
Pardeville bridge to Grant *c*	1.95	....	102.07	....
Grant to West Canada creek *c*	1.15	....	103.22	363.94
WEST CANADA CREEK				
Black creek to Twin Rock bridge *c*	0.50	....	....	364.44
Twin Rock bridge to Hinckley dam *c*	8.50	....	....	372.94
Hinckley dam to Prospect	2.00	....	....	374.94
Prospect to Trenton Falls	0.90	....	....	375.84
Trenton Falls to Steuben creek	6.20	....	....	382.04
Steuben Creek				
Source to mouth	....	....	52.30	434.34
WEST CANADA CREEK				
Steuben creek to Poland (first bridge below)	35.80	....	....	470.14
Poland to Newport	10.00	....	....	480.14
Newport to Middleville	47.20	....	....	527.34
Middleville to Kast bridge	47.50	....	....	574.84
Kast bridge to mouth	8.80	....	....	583.64

c Creek drowned out by reservoir.

Drainage areas of EAST CANADA CREEK
(From U. S. G. S. topographic maps)

LIMITS	AREA IN SQUARE MILES			
	Place to place	Sub-total	Branch total	Total
EAST CANADA CREEK				
Above Oregon	40.13	....	....	40.13
Oregon to junction with North creek	10.42	....	....	50.55
North Creek				
Source to junction with East Canada creek	18.60	....	18.60	69.15
EAST CANADA CREEK				
Junction with North creek to junction with Trammel creek	8.63	....	....	77.78
Trammel Creek				
Source to junction with East Canada creek	12.04	....	....	89.82
EAST CANADA CREEK				
Junction with Trammel creek to junction with Ayers creek (Stratford)	0.20	....	....	90.02
Ayers Creek				
Source to junction with East Canada creek	13.63	....	....	103.65
EAST CANADA CREEK				
Junction with Ayers creek (Stratford) to Emmonsburg	8.05	....	....	111.70
Emmonsburg to junction with Big Sprite creek	15.68	....	....	127.38
Big Sprite Creek				
Source to Stewart landing	40.90	....	....	....
Stewart landing to junction with East Canada creek	7.87	....	48.77	176.15
EAST CANADA CREEK				
Junction with Big Sprite creek to junction with Middle Sprite creek	3.70	....	....	179.85
Middle Sprite Creek				
Source to junction with East Canada creek	22.65	....	....	202.50
EAST CANADA CREEK				
Junction with Middle Sprite creek to junction with Spruce creek	0.20	....	....	202.70
Spruce Creek				
Source to dam at Diamond Hill	36.20	36.20	....	*a* 253.18
Dam at Diamond Hill to Salisbury	13.08	49.28	....	....
Salisbury to junction with East Canada creek	1.20	....	50.48	....
EAST CANADA CREEK				
Junction with Spruce creek to lower bridge, Dolgeville	0.60	....	....	*a* 253.78
Lower bridge, Dolgeville, to High falls	3.64	....	....	*a* 257.42
High falls to junction with Gillett creek	0.84	....	....	*a* 258.26
Gillett Creek				
Source to junction with East Canada creek	10.92	....	....	*a* 269.18
EAST CANADA CREEK				
Junction with Gillett creek to Ingham Mills	8.73	....	....	*a* 277.91
Ingham Mills to Beardslee Falls	3.60	....	....	*a* 281.51
Beardslee Falls to mouth	0.30	....	....	*a* 281.81

a Corrected for error of 0.2 noted in Report of State Engineer and Surveyor for 1916, Vol. II, pages 322 and 325.

Drainage areas of SCHOHARIE CREEK*

(From U. S. G. S. topographic maps)

LIMITS	AREA IN SQUARE MILES	
	Place to place	Total
Source to Pratt Rocks, about 1¼ miles above Prattsville highway bridge	225.89	225.89
Pratt Rocks to Prattsville gage at highway bridge, Prattsville	10.23	236.12
Prattsville gage to Devasego Falls, at falls	6.84	242.96
Devasego Falls to Gilboa, at power dam	70.75	313.71
Gilboa to North Blenheim, at old dam	88.85	402.56
North Blenheim to Middleburg, at highway bridge	129.01	531.57
Middleburg to Schoharie Junction, at D. & H. R. R. bridge	284.13	815.70
Schoharie Junction to Sloansville, at highway bridge	16.35	832.05
Sloansville to Esperance, at highway bridge	43.77	875.82
Esperance to Burtonville, at power dam, about ½ mile above highway bridge	10.87	886.69
Burtonville to Florida, just below fordway	19.43	906.12
Florida to Wellsville, about ¾ mile above highway bridge	7.95	914.07
Wellsville to Mill Point, about ½ mile below highway bridge	6.36	920.43
Mill Point to Fort Hunter, at Fort Hunter feeder dam	9.45	929.88

* This table is the result of a joint determination of drainage areas of Schoharie creek, based on independent computations by the engineers of the Board of Water Supply of the city of New York and of the Department of State Engineer.

DELTA RESERVOIR

Gage No. 155

This station, established April, 1913, is located at the dam of the Delta reservoir on the Mohawk river. The gage is a concrete staff on the substructure of the gate-house. This station indicates the surface of the Delta reservoir, constructed in connection with the Barge canal work to supply the Rome summit level. It is read twice daily — at 9 A. M. and 4 P. M.— to tenths. The dam is a concrete structure with an ogee crest 300 feet long at elevation 550.0. There are four 60-inch pipes to pass water downstream and a 30-inch pipe line to supply water to the Black River canal. The reservoir at crest level has an area of about 4⅓ square miles and a capacity of 2,750,000,000 cubic feet.

Daily elevation of water-surface (B. C. datum) of DELTA RESERVOIR AT DELTA DAM, for the year ended June 30, 1919. William Masner and Michael E. McCurn, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	540.45	536.15	530.6	535.55	541.85	544.7	539.55	542.2	539.2	549.0	550.15	549.9
2.....	540.5	535.95	530.55	535.5	542.1	544.7	540.9	542.1	539.7	548.4	550.95	549.75
3.....	540.4	535.75	530.35	535.5	542.5	544.7	541.2	542.0	540.0	547.85	550.75	549.55
4.....	540.3	535.55	530.05	535.6	542.65	544.15	541.3	541.85	540.05	548.05	550.6	549.35
5.....	540.15	535.35	529.9	535.5	542.85	543.15	541.4	541.7	540.5	548.35	550.5	549.25
6.....	540.0	535.2	530.0	535.75	542.9	542.2	541.4	541.55	540.7	548.65	550.45	549.1
7.....	539.85	535.05	529.95	536.35	542.9	541.25	541.4	541.35	540.7	548.95	550.4	549.0
8.....	539.65	534.85	529.75	536.5	542.9	540.25	541.4	541.2	540.85	549.15	550.4	548.9
9.....	539.5	534.95	529.55	536.4	542.8	539.4	541.4	541.1	541.05	549.6	550.3	548.8
10.....	539.4	534.9	529.35	536.3	542.9	538.55	541.3	540.95	542.3	550.0	550.3	548.7
11.....	539.3	534.75	529.15	536.25	543.0	537.65	541.3	540.75	542.85	550.6	550.65	548.6
12.....	539.25	534.65	529.0	536.1	543.0	536.55	541.2	540.5	543.0	551.25	550.7	548.5
13.....	539.1	534.45	529.35	536.05	543.0	535.45	541.1	540.35	543.35	550.85	550.65	548.4
14.....	539.0	534.25	529.8	536.0	542.9	535.0	541.1	540.2	543.5	550.65	550.55	548.3
15.....	538.9	534.05	529.8	535.95	542.85	536.2	551.1	540.6	543.65	550.45	550.4	548.2
16.....	538.8	533.8	529.7	535.9	542.8	536.05	541.0	540.70	543.8	550.25	550.3	548.1
17.....	538.65	533.55	530.3	535.75	542.7	535.2	541.0	540.55	544.15	550.2	550.95	548.0
18.....	538.6	533.35	532.05	535.6	543.1	534.15	540.85	540.4	545.45	550.1	551.3	548.0
19.....	538.5	533.1	532.1	535.5	543.6	532.05	540.75	540.3	547.65	550.0	550.95	547.9
20.....	538.35	532.85	533.6	535.45	544.0	531.95	540.6	540.15	548.25	549.85	550.65	547.9
21.....	538.15	532.65	534.25	537.0	544.1	531.9	540.45	540.05	549.3	549.65	550.6	547.8
22.....	537.95	532.45	534.4	537.3	544.2	532.1	540.4	539.85	550.2	549.45	550.5	547.7
23.....	537.8	532.25	534.5	537.4	544.2	535.1	540.3	539.7	550.3	549.3	550.6	547.6
24.....	537.65	532.05	534.65	537.4	544.15	535.95	541.7	539.6	550.4	549.45	550.7	547.5
25.....	537.45	531.85	534.95	537.3	544.1	538.05	542.15	539.35	550.4	549.75	550.7	547.4
26.....	537.35	531.65	535.0	538.45	544.0	539.1	542.3	539.3	550.25	549.85	550.65	547.4
27.....	537.15	531.45	535.25	539.45	544.0	539.45	542.4	539.15	550.2	549.95	550.55	547.5
28.....	536.95	531.25	535.5	539.6	544.0	539.6	542.5	539.1	550.5	550.05	550.4	547.6
29.....	536.75	531.05	535.6	539.75	544.35	539.6	542.5	......	550.15	550.15	550.35	547.7
30.....	536.55	530.85	535.65	539.95	544.6	539.5	542.45	......	549.85	550.2	550.25	547.7
31.....	536.35	530.6	......	541.3	......	539.5	542.35	......	549.5	......	550.1	......

MOHAWK RIVER ABOVE STATE DAM, ROME

Gage No. 37

This station, established May 3, 1904, is located about 100 feet above the old State dam at Rome. The gage, originally No. 154 but now recorded as No. 37, is a staff secured to an elm tree at the head of the Erie canal feeder and gives the elevation of water-surface above the dam. It is read once daily — at 7 or 8 A. M.— to tenths, the hundredths in the table being due to the datum of the gage. The gage bench-mark is a copper plug on the lower side of the west wing of the tow-path side of the Mohawk feeder and is at elevation 434.295 (B. C. datum).

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER ABOVE STATE DAM AT ROME, for the year ended June 30, 1919. John Phillips, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	431.93	431.83	431.83	431.93	432.13	431.93	431.93	431.93	432.03	432.93	431.83	432.03
2.....	431.83	431.83	431.83	432.03	432.13	431.93	432.03	431.93	431.93	432.43	432.03	432.03
3.....	431.83	431.93	431.93	432.03	432.03	431.93	432.13	432.03	431.93	432.43	432.33	432.03
4.....	431.83	431.83	431.93	431.93	432.03	431.93	432.13	431.93	431.93	432.43	432.33	432.03
5.....	431.83	431.93	431.83	431.93	432.03	431.93	432.03	431.93	431.93	432.53	432.33	431.93
6.....	431.83	431.83	431.93	432.03	431.93	432.03	432.03	432.03	431.93	432.43	432.13	432.03
7.....	431.83	431.83	431.83	431.93	432.03	431.93	431.93	432.03	431.93	432.53	431.93	431.93
8.....	431.83	431.93	431.93	431.93	431.93	431.93	431.93	432.03	431.93	432.33	431.83	432.03
9.....	431.83	431.93	431.83	431.93	431.93	432.03	431.93	431.93	431.83	432.13	431.83	432.03
10.....	431.93	431.93	431.83	431.83	432.03	432.33	431.83	431.93	431.93	431.93	431.93	431.93
11.....	431.93	431.83	431.93	431.93	432.03	432.63	431.83	431.93	431.93	432.13	432.13	432.03
12.....	431.93	431.83	432.03	431.93	432.03	432.63	431.83	432.03	431.93	433.73	432.13	432.03
13.....	431.83	431.83	432.03	431.93	431.93	432.63	431.83	431.93	431.93	432.93	432.13	431.93
14.....	431.93	431.93	431.93	431.93	432.03	432.63	431.83	432.03	431.83	432.73	432.13	431.93
15.....	431.93	431.83	431.93	432.03	431.93	432.73	431.83	432.03	431.83	432.33	432.13	432.03
16.....	431.93	431.83	431.93	431.93	431.93	432.73	431.93	431.93	431.93	432.33	432.53	432.03
17.....	431.93	431.93	431.93	431.93	432.03	432.73	431.93	431.93	431.93	432.33	432.93	432.03
18.....	431.93	431.83	432.03	432.03	432.03	432.63	432.03	431.93	431.93	432.33	433.43	431.93
19.....	431.83	431.83	431.93	431.93	432.03	432.63	432.03	431.93	431.83	432.23	432.93	432.03
20.....	431.93	431.93	431.93	432.03	432.03	432.63	432.03	431.93	431.83	432.23	432.43	432.03
21.....	431.83	431.83	432.03	432.03	432.03	432.23	431.93	431.93	431.83	432.33	432.53	432.13
22.....	431.83	431.83	431.93	432.03	431.93	431.93	431.93	431.93	431.83	432.23	432.43	431.83
23.....	431.83	431.93	431.93	432.03	432.03	432.03	431.93	431.83	431.93	432.23	432.43	431.83
24.....	431.93	431.83	432.03	432.03	432.03	432.03	432.03	431.83	431.83	432.23	432.33	431.83
25.....	431.83	431.83	431.93	431.93	432.03	431.93	432.03	431.93	431.83	432.23	432.33	431.93
26.....	431.83	431.83	431.93	432.03	431.93	431.93	431.93	431.93	431.83	432.13	432.43	432.03
27.....	431.83	431.83	432.03	432.03	431.93	432.03	431.93	431.83	431.93	432.03	432.43	431.93
28.....	431.83	431.93	431.93	431.93	432.03	432.03	431.93	431.93	432.13	431.83	432.23	431.83
29.....	431.83	431.93	431.93	432.03	432.03	431.93	431.93	......	432.13	431.83	432.23	431.93
30.....	431.93	431.93	431.93	432.03	432.03	431.83	432.03	......	432.23	431.83	432.13	431.93
31.....	431.83	431.93	......	432.03	......	431.83	431.93	......	432.23	......	432.23	......

MOHAWK RIVER ABOVE RETENTION DAM, ROME

Gage No. 154

This station, replacing old No. 153 (below State dam, discontinued December 31, 1917) was established December 15, 1916, above the new State retention dam at Rome. A standard slope gage was erected on the right bank of the river about 150 feet above the retention dam, and has a range of 5 feet, between elevations 426.0 and 431.0 (B. C. datum). A reference point was also established on the right abutment and readings are taken by measuring down from this point. Records began February 1, 1918. The reference point is at elevation 434.0.

Readings are taken once daily — at 7 or 8 A. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER ABOVE RETENTION DAM AT ROME, for the year ended June 30, 1919. John Phillips, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	427.6	427.6	427.5	427.4	427.7	427.5	427.5	427.6	427.5	427.8	427.4	427.6
2.....	427.6	427.6	427.5	427.5	427.7	427.5	427.6	427.5	427.5	427.8	427.6	427.6
3.....	427.6	427.5	427.6	427.5	427.6	427.5	427.6	427.6	427.4	427.9	427.8	427.6
4.....	427.6	427.5	427.6	427.6	427.6	427.4	427.6	427.5	427.5	427.8	427.7	427.6
5....	427.5	427.6	427.5	427.5	427.6	427.5	427.5	427.5	427.4	427.9	427.7	427.5
6.....	427.6	427.5	427.6	427.6	427.5	427.5	427.5	427.5	427.4	427.8	427.6	427.6
7.....	427.5	427.4	427.5	427.5	427.6	427.5	427.4	427.5	427.4	427.8	427.5	427.5
8.....	427.6	427.5	427.5	427.6	427.5	427.5	427.5	427.6	427.4	427.6	427.4	427.6
9.. .	427.6	427.5	427.5	427.6	427.6	427.6	427.5	427.5	427.3	427.5	427.4	427.6
10.....	427.7	427.6	427.5	427.4	427.5	427.8	427.4	427.5	427.3	427.5	427.5	427.5
11.....	427.6	427.5	427.4	427.5	427.6	428.1	427.4	427.6	427.4	427.5	427.7	427.6
12.....	427.6	427.4	427.5	427.6	427.6	428.1	427.5	427.6	427.4	428.7	427.7	427.6
13.....	427.5	427.4	427.6	427.5	427.5	428.1	427.4	427.5	427.5	428.4	427.7	427.5
14.....	427.6	427.3	427.5	427.6	427.6	428.1	427.5	427.5	427.5	428.3	427.7	427.5
15.....	427.6	427.4	427.4	427.6	427.6	428.2	427.4	427.6	427.4	427.6	427.7	427.6
16.....	427.6	427.5	427.5	427.6	427.6	428.3	427.6	427.5	427.5	427.7	428.1	427.7
17.....	427.5	427.5	427.6	427.5	427.6	428.3	427.6	427.4	427.5	427.8	428.6	427.6
18.....	427.6	427.4	427.6	427.6	427.7	428.1	427.6	427.4	427.5	427.7	428.8	427.5
19.....	427.6	427.5	427.5	427.5	427.6	428.1	427.6	427.4	427.5	427.6	428.6	427.6
20.....	427.6	427.6	427.6	427.5	427.6	428.2	427.6	427.4	427.5	427.7	428.0	427.6
21.....	427.5	427.5	427.6	427.6	427.5	427.8	427.5	427.4	427.4	427.7	428.0	427.7
22.....	427.4	427.5	427.5	427.6	427.5	427.5	427.5	427.3	427.4	427.6	428.0	427.4
23.....	427.5	427.6	427.4	427.6	427.6	427.5	427.5	427.3	427.5	427.7	428.0	427.5
24.....	427.6	427.5	427.5	427.6	427.6	427.6	427.6	427.4	427.4	427.7	427.9	427.5
25.....	427.5	427.4	427.4	427.5	427.6	427.5	427.6	427.4	427.4	427.7	427.9	427.5
26.....	427.5	427.5	427.4	427.6	427.5	427.5	427.5	427.5	427.4	427.7	428.0	427.6
27.....	427.5	427.5	427.5	427.6	427.5	427.6	427.6	427.4	427.5	427.6	428.0	427.5
28.....	427.5	427.6	427.4	427.5	427.6	427.6	427.5	427.4	427.7	427.4	427.8	427.4
29.....	427.5	427.6	427.4	427.6	427.6	427.5	427.6	......	427.7	427.4	427.8	427.3
30.....	427.5	427.6	427.5	427.6	427.6	427.5	427.6	......	427.6	427.4	427.7	427.3
31.....	427.6	427.6	......	427.6	......	427.4	427.6	......	427.6	......	427.6	......

MOHAWK RIVER BELOW RETENTION DAM, ROME

Gage No. 153

This station, established February 1, 1918, is located on the canalized Mohawk river about 300 feet below the retention dam and east of the guard-gate. A reference point is established at the east end of the north abutment and readings are made by measuring down from this point. The reference point is at elevation 432.0 (B. C. datum).

Readings are taken once daily to tenths:

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER BELOW RETENTION DAM AT ROME, for the year ended June 30, 1919. John Phillips, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	420.6	420.3	420.3	420.2	420.4	420.1	420.2	420.4	420.3	420.6	420.4	420.1
2	420.6	420.2	420.4	420.3	420.4	420.1	420.4	420.4	420.4	420.6	420.5	420.1
3	420.6	420.3	420.3	420.3	420.3	420.1	420.6	420.4	420.4	420.5	420.5	420.2
4	420.6	420.2	420.2	420.3	420.4	420.2	420.6	420.3	420.4	420.5	420.5	420.2
5	420.4	420.2	420.3	420.4	420.3	420.1	420.5	420.3	420.4	420.5	420.6	420.1
6	420.5	420.2	420.4	420.4	420.3	420.1	420.5	420.2	420.4	420.4	420.5	420.2
7	420.6	420.3	420.2	420.3	420.2	420.1	420.4	420.2	420.3	420.4	420.4	420.1
8	420.5	420.3	420.3	420.2	420.3	420.2	420.4	420.2	420.3	420.4	420.3	420.1
9	420.6	420.4	420.2	420.3	420.2	420.1	420.3	420.3	420.3	420.4	420.3	420.1
10	420.6	420.5	420.2	420.2	420.3	420.7	420.3	420.3	420.3	420.5	420.4	419.9
11	420.5	420.4	420.3	420.2	420.3	420.9	420.2	420.2	420.4	420.5	420.6	420.0
12	420.5	420.3	420.3	420.2	420.3	420.8	420.3	420.2	420.4	421.0	420.5	419.8
13	420.5	420.2	420.3	420.3	420.2	420.9	420.2	420.3	420.4	420.4	420.5	419.8
14	420.6	420.2	420.2	420.3	420.3	421.0	420.2	420.2	420.4	420.3	420.4	419.8
15	420.5	420.2	420.3	420.2	420.3	421.0	420.3	420.3	420.4	420.4	420.4	419.9
16	420.6	420.1	420.3	420.2	420.3	420.9	420.4	420.2	420.4	420.4	420.4	419.8
17	420.4	420.2	420.4	420.3	420.3	420.9	420.4	420.2	420.5	420.5	420.8	419.7
18	420.5	420.3	420.5	420.3	420.4	420.9	420.5	420.3	420.4	420.4	420.8	419.7
19	420.4	420.2	420.4	420.2	420.3	421.0	420.4	420.3	420.4	420.4	420.6	419.9
20	420.4	420.3	420.4	420.3	420.2	421.0	420.4	420.2	420.3	420.4	420.5	420.1
21	420.3	420.3	420.3	420.4	420.3	420.6	420.5	420.2	420.4	420.4	420.5	420.2
22	420.3	420.3	420.4	420.5	420.2	420.4	420.4	420.1	420.4	420.3	420.4	420.1
23	420.4	420.3	420.4	420.4	420.2	420.3	420.4	420.1	420.5	420.2	420.3	420.0
24	420.2	420.3	420.4	420.3	420.2	420.3	420.5	420.2	420.4	420.2	420.5	420.1
25	420.3	420.4	420.3	420.2	420.3	420.4	420.4	420.1	420.4	420.2	420.5	420.0
26	420.3	420.3	420.2	420.3	420.2	420.3	420.3	420.2	420.5	420.2	420.5	420.0
27	420.3	420.3	420.2	420.4	420.2	420.2	420.4	420.2	420.4	420.2	420.5	420.1
28	420.2	420.2	420.2	420.4	420.2	420.1	420.4	420.2	420.4	420.2	420.4	420.2
29	420.2	420.3	420.3	420.3	420.2	420.1	420.4	......	420.5	420.3	420.4	420.2
30	420.3	420.2	420.4	420.2	420.1	420.2	420.3	......	420.5	420.3	420.5	420.2
31	420.3	420.2	......	420.3	......	420.1	420.3	......	420.5	......	420.4	......

BARGE CANAL ABOVE LOCK No. 20, NEAR WHITESBORO

Gage No. 407

This new station, gage No. 407, is located at the west end of the southwest gate recess of lock No. 20, about a mile north of the village of Whitesboro. The water-surface elevation is obtained by measuring with a rod from a point in the top of the masonry, the elevation of which is 425.00 (B. C. datum). The gage bench-

mark, a point on the northwest wing wall, is at elevation 424.00 (B. C. datum).

. The gage was read twice daily — at 6 A. M. and 6 P. M.— to tenths.

Daily elevation of water-surface (B. C. datum) of BARGE CANAL ABOVE LOCK No. 20, NEAR WHITESBORO, for the year ended June 30, 1919

DAY	May	June	DAY	May	June	DAY	May	June
1	420.5	419.8	11	420.65	420.25	21	420.45	420.1
2	420.35	419.6	12	420.6	420.05	22	420.4	420.15
3	420.45	420.05	13	420.45	420.0	23	420.4	420.0
4	420.4	420.2	14	420.35	420.1	24	420.4	420.0
5	420.4	420.2	15	420.35	419.95	25	420.45	419.95
6	420.25	420.4	16	420.3	419.75	26	420.4	419.95
7	420.3	420.35	17	420.45	419.95	27	420.35	419.95
8	420.35	420.15	18	420.6	419.8	28	420.25	420.2
9	420.3	420.2	19	420.45	420.1	29	420.3	420.05
10	420.3	420.15	20	420.45	419.9	30	419.9	420.1
						31	419.7	......

NOTE.— Readings began May 1, 1919.

BARGE CANAL BELOW LOCK No. 20, NEAR WHITESBORO

Gage No. 408

This new station, gage No. 408, is located on the southeast approach wall at foot of stairs of lock No. 20, about a mile north of the village of Whitesboro. The water-surface elevation of the lower pool is obtained by measuring with a rod from a point in the top of the masonry, the elevation of which is 408.00 (B. C. datum). The gage bench-mark is on the northwest wing wall of the lock at elevation 424.00 (B. C. datum).

The gage was read twice daily — at 6 A. M. and 6 P. M.— to tenths.

Daily elevation of water-surface (B. C. datum) of BARGE CANAL BELOW LOCK No. 20, NEAR WHITESBORO, for the year ended June 30, 1919

DAY	May	June	DAY	May	June	DAY	May	June
1	403.9	402.85	11	404.65	403.8	21	403.8	403.75
2	404.35	403.25	12	404.2	403.85	22	403.8	403.5
3	404.1	403.1	13	404.15	403.4	23	403.85	403.55
4	404.1	403.9	14	403.95	403.35	24	404.0	403.8
5	404.05	403.95	15	403.95	403.3	25	404.1	403.65
6	404.05	403.85	16	403.8	403.75	26	403.85	404.05
7	404.15	403.8	17	403.85	403.65	27	403.85	403.85
8	404.05	404.05	18	404.1	404.1	28	403.85	403.95
9	404.05	403.95	19	403.9	403.3	29	403.85	404.1
10	404.15	403.85	20	403.8	403.9	30	403.7	403.7
						31	403.6	......

NOTE.— Readings began May 1, 1919.

MOHAWK RIVER AT FRANKFORT

Gage No. 151

This station was established January 25, 1913, at the highway bridge over the Mohawk river on the Dyke road between Frankfort and North Frankfort about 10 miles east of Utica. The gage is a standard chain on the downstream side of the new steel bridge. It is read twice daily — morning and afternoon — to tenths. The water-surface indicated is that of the river about 1,600 feet below the new retention dam and about 200 feet below the end of the land-line running east from Barge canal lock No. 19 at Sterling creek.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT FRANKFORT, for the year ended June 30, 1919. C. F. Loring and Forrest O. Deyle, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	383.80	384.30	384.10	383.60	383.95	382.25	381.12	379.10	381.75	380.95	380.70
2	383.30	383.80	383.75	383.15	382.35	382.18	383.80	379.32	382.65	380.82	383.05
3	383.30	383.05	383.50	384.15	382.30	382.65	383.05	379.30	381.15	380.60	383.60
4	383.35	383.35	383.60	384.30	382.10	383.68	381.25	379.35	381.00	381.05	381.90
5	383.10	383.90	*a*	383.58	382.50	*a*	380.35	379.25	381.75	382.05	381.92
6	382.80	383.95	*a*	383.50	382.30	383.30	379.95	379.25	381.45	382.15	382.80
7	382.85	383.90	383.60	382.40	381.92	383.00	380.05	379.05	380.50	381.70	382.25
8	382.75	383.44	383.70	381.45	381.78	382.05	380.28	378.95	379.85	381.82	382.90
9	382.75	383.95	383.80	381.38	382.45	383.42	380.10	378.90	380.40	381.92	382.65
10	383.20	383.70	383.70	381.88	382.05	384.00	380.25	378.78	384.10	382.20	382.50
11	383.95	383.25	383.82	382.00	382.00	383.78	380.35	378.80	383.15	382.75	384.55
12	383.90	381.85	384.00	381.85	382.30	383.85	379.70	378.80	381.45	385.25	384.65
13	383.65	382.70	383.45	381.95	383.02	381.80	379.35	378.88	381.45	385.40	383.75
14	383.70	383.05	383.90	382.15	382.55	383.20	379.40	379.15	381.10	383.20	382.65
15	382.70	383.10	384.05	381.95	382.20	386.28	379.60	380.30	380.25	381.82	382.15
16	382.05	383.30	384.25	382.30	381.88	384.40	379.45	379.90	380.15	381.45	381.52
17	382.70	383.30	383.82	382.45	381.95	383.12	379.55	379.40	382.15	381.15	381.30
18	383.30	383.55	383.45	382.10	383.15	382.08	379.70	379.45	383.35	381.40	384.52
19	383.75	383.45	383.45	382.28	384.12	381.18	379.65	379.15	382.95	381.05	383.55
20	383.70	383.30	383.20	382.88	383.25	380.95	379.60	379.10	381.60	380.55	383.10
21	383.40	383.35	384.30	383.60	382.70	380.15	379.55	379.00	381.60	380.50	382.35
22	383.30	383.45	383.15	382.85	382.58	379.55	379.60	378.95	381.25	380.55	382.05
23	383.50	383.60	383.30	381.98	382.65	383.00	379.75	379.10	380.68	380.10	382.95
24	383.65	383.65	383.35	381.95	382.55	382.10	381.00	379.22	380.70	379.95	383.55
25	383.75	383.60	383.90	382.15	381.90	382.78	381.30	379.35	381.20	380.45	384.00
26	383.80	383.55	383.75	383.10	381.78	383.15	380.40	379.40	380.55	380.45	383.90
27	383.90	383.55	383.85	382.75	381.30	381.10	380.10	379.58	380.35	380.25	383.90
28	383.65	383.05	384.00	382.10	381.58	380.35	379.95	379.42	382.10	380.65	383.45
29	383.10	383.60	384.60	381.95	381.75	379.88	379.70	......	381.25	380.78	382.40
30	383.20	383.50	383.90	383.35	382.72	379.55	379.65	......	381.05	380.50	381 80
31	384.10	383.65	......	385.65	......	379.62	379.50	......	381.15	......	382.30

a No record.
NOTE.— Station discontinued May 31, 1919.

MOHAWK RIVER AT ILION

Gage No. 150

This station, established January 24, 1913, is located at the highway bridge over the Mohawk river opposite the village of Ilion and about 2 miles above Barge canal dam No. 14 at Herkimer. A standard chain gage, attached to the downstream truss near the center of the new bridge, is read to tenths twice daily — morning and afternoon.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT ILION, fo the year ended June 30, 1919. P. C. Earl, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	384.55	384.25	384.25	383.6	384.1	382.7	380.9	379.6	382.2	380.75	380.7	382.75
2.....	383.15	384.2	383.75	383.4	383.3	383.0	381.55	379.5	382.2	380.6	382.2	382.65
3.....	383.4	383.65	383.6	384.7	382.95	383.4	382.65	379.15	381.15	380.7	383.5	382.7
4.....	383.35	383.5	383.65	384.8	382.6	383.9	381.85	379.05	380.85	*a*	382.0	382.6
5.....	383.3	384.1	383.9	383.8	382.85	383.75	380.85	379.2	381.45	*a*	381.7	382.7
6.....	382.95	384.4	383.95	383.4	381.65	383.65	380.15	378.85	381.35	*a*	381.9	382.85
7.....	382.8	383.85	383.85	382.7	380.95	383.2	379.95	378.65	380.65	*a*	382.45	382.85
8.....	382.65	383.7	383.7	381.2	381.05	382.85	380.05	378.5	379.85	*a*	382.85	382.6
9.....	382.55	384.0	383.85	380.65	381.1	383.05	380.15	378.55	380.2	*a*	382.5	382.4
10.....	383.2	383.9	384.05	381.75	381.1	383.15	380.25	378.6	383.55	*a*	382.55	382.55
11.....	384.05	383.05	384.0	381.95	381.65	383.15	380.15	378.6	382.8	*a*	384.6	382.65
12.....	383.95	382.55	383.95	381.9	382.05	382.8	379.9	378.7	381.65	385.0	384.4	382.3
13.....	383.7	382.75	384.05	382.2	332.45	382.05	379.35	379.95	381.65	385.05	383.6	382.35
14.....	383.85	383.2	384.05	382.35	332.3	382.85	379.3	380.65	381.1	382.6	382.45	382.4
15.....	383.0	383.5	384.2	382.6	382.65	386.5	379.3	380.75	380.15	381.5	382.0	382.4
16.....	381.95	383.4	384.25	382.6	382.6	383.4	379.2	380.0	379.7	381.15	381.4	382.25
17.....	382.55	383.6	333.95	382.55	381.95	383.4	379.35	379.3	381.5	381.05	381.35	382.15
18.....	383.5	383.65	382.85	332.65	383.1	382.8	379.5	379.15	382.7	381.0	384.25	382.2
19.....	383.75	333.15	383.15	382.8	382.8	381.55	379.6	379.0	382.65	380.75	383.5	382.25
20.....	383.45	383.5	383.4	382.7	382.7	381.05	379.55	379.2	381.3	380.55	382.95	382.3
21.....	383.4	383.3	333.95	382.3	383.6	380.85	379.6	379.15	381.1	380.5	382.35	382.45
22.....	383.3	383.55	383.45	382.5	383.35	*	379.6	379.0	380.8	330.85	332.0	382.55
23.....	383.55	383.55	383.35	332.3	332.9	382.8	379.65	379.1	330.65	380.0	382.7	332.5
24.....	333.65	383.85	383.85	381.9	382.45	*	*a*	379.05	380.65	379.85	383.2	332.75
25.....	383.7	383.65	383.85	382.0	382.05	383.6	381.15	379.35	381.4	330.45	383.85	382.75
26.....	383.85	383.55	333.7	383 1	381.8	382.6	380.6	379.6	380.6	380.35	383.8	382.7
27.....	383.9	383.7	383.7	382.8	381.55	381.35	379.8	379 7	380.65	380.45	383.85	382.75
28.....	383.65	383.4	384.6	382.85	331.4	380.55	379.65	379.85	332.3	330.65	383.4	382.75
29.....	383.1	383.9	383.8	382.05	381.3	379.95	379.6	......	382.0	380.5	382.75	382.65
30.....	383.5	384.0	383.7	383.3	381.55	379.6	379.6	......	381.4	330.3	382.7	382.55
31.....	384.15	383.65	......	385.85	......	380.05	379.85	......	381.1	......	382.7	......

* Record not published. *a* No record.

MOHAWK RIVER AT MOHAWK STREET, HERKIMER

Gage No. 149

This station, established November 23, 1904, is located at the highway bridge immediately west of the Utica and Mohawk Valley electric railway bridge over the Mohawk river at Mohawk street, connecting the villages of Herkimer and Mohawk. A

standard chain gage, formerly on the upstream wing of the north, or left abutment of the bridge, is now located on the ends of the sidewalk stringers which project out from the east sidewalk of the highway bridge, between the second and third post from the north portal. This gage is about 100 feet above dam No. 14, which is of a movable type with a fixed sill at elevation 374.0. The change in location was made January 30, 1918, changing also the zero of the gage from elevation 374.00 to 375.00. The chain length is 19.77 feet. The gage bench-mark, a cross chiseled on the north abutment of the N. Y. S. railway bridge near angle of east wing and 2.7 feet from face of coping, is at elevation 391.33 (B. C. datum). The gage also indicates closely the water-surface above the canal guard-gate at this locality. Readings are taken twice daily — morning and afternoon — to half-tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT MOHAWK STREET BRIDGE, HERKIMER, for the year ended June 30, 1919. H. S. Bishton and C. G. Ranney, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	382.75	383.32	383.62	381.82	382.40	383.60	380.40	379.20	378.90	381.55	380.40	382.00
2.....	382.88	383.75	383.65	381.80	382.39	383.60	380.40	379.05	378.92	381.52	380.50	382.50
3.....	382.95	383.98	383.58	381.80	382.28	383.60	380.40	378.95	378.92	381.60	380.60	382.50
4.....	383.20	383.65	383.52	381.72	382.30	383.65	380.40	378.80	378.95	381.60	381.55	382.40
5.....	382.78	384.12	383.55	381.78	382.30	383.65	380.28	378.60	378.90	381.60	381.85	382.80
6.....	382.70	383.95	383.60	*a*	382.28	383.62	380.20	378.62	378.90	381.50	382.50	382.95
7.....	382.72	383.90	383.60	*a*	382.25	383.70	380.20	378.62	378.98	381.50	383.60	382.52
8.....	382.95	383.82	383.62	*a*	382.22	383.70	380.20	378.60	379.25	381.52	383.80	382.45
9.....	383.15	383.55	383.62	*a*	382.22	383.70	380.18	378.58	379.10	381.58	384.08	382.40
10.....	383.22	383.40	383.58	*a*	382.10	383.68	380.05	378.50	379.20	381.60	384.40	382.55
11.....	384.15	382.88	383.58	*a*	382.10	383.70	380.00	378.55	379.30	382.75	384.40	382.38
12.....	384.18	382.80	383.28	*a*	382.10	383.70	380.00	378.60	379.50	384.00	384.45	382.20
13.....	383.92	382.68	383.28	*a*	382.30	383.70	380.05	378.60	379.55	384.52	384.45	382.30
14.....	384.00	382.52	383.20	*a*	382.30	383.75	380.10	378.58	379.70	384.52	384.40	381.90
15.....	383.92	382.82	383.28	381.80	382.30	383.72	380.10	378.55	379.70	384.52	384.35	382.05
16.....	383.72	383.10	383.22	381.80	382.45	383.70	380.00	378.60	379.70	384.45	384.30	381.90
17.....	383.62	383.35	383.18	381.82	383.45	383.70	380.05	378.60	379.70	384.48	384.30	382.15
18.....	383.42	383.58	383.35	381.80	383.45	383.75	380.10	378.65	379.72	384.35	384.20	382.20
19.....	383.38	383.52	383.22	381.80	383.45	383.78	380.00	378.65	379.70	384.20	384.20	382.20
20.....	383.35	383.25	383.38	382.30	383.50	383.78	380.00	378.70	379.78	384.18	384.20	382.18
21.....	383.25	383.52	383.48	382.50	383.50	383.80	379.92	378.75	379.80	382.95	384.00	382.20
22.....	383.28	383.45	383.45	382.50	383.50	383.75	379.90	378.80	379.80	382.55	384.00	382.60
23.....	383.28	383.58	383.50	382.58	383.50	383.75	379.95	378.78	379.82	382.35	383.90	382.38
24.....	383.20	383.48	383.48	382.58	383.50	383.78	379.90	378.80	379.85	381.75	383.90	382.08
25.....	383.12	383.75	383.52	382.55	383.50	383.75	379.80	378.80	379.90	381.60	*a*	381.90
26.....	383.30	383.82	383.62	382.50	383.50	383.75	379.80	378.82	379.92	381.50	*a*	382.30
27.....	382.98	383.80	383.58	382.50	383.55	383.78	379.70	378.82	379.98	381.00	*a*	382.68
28.....	382.90	383.72	383.62	382.50	383.55	383.78	379.62	378.82	380.28	380.45	*a*	382.85
29.....	382.92	383.62	383.55	382.48	383.50	383.35	379.55	......	381.30	380.20	*a*	383.02
30.....	383.05	383.58	381.80	382.50	383.58	382.15	379.50	......	381.50	380.22	*a*	382.48
31.....	383.32	383.58	......	382.50	......	381.30	379.45	......	381.55	......	*a*	......

a No record.

MOHAWK RIVER AT WASHINGTON STREET, HERKIMER

Gage No. 148

This station, established February 4, 1913, is located at the Washington street bridge over the Mohawk river, opposite the village of Herkimer. It is about 4,700 feet below dam No. 14 and about 2,700 feet above the mouth of West Canada creek. This section of the river is not canalized. The gage is a standard chain attached to the upstream side of the bridge and is read twice daily — morning and afternoon — to hundredths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT WASHINGTON STREET BRIDGE, HERKIMER, for the year ended June 30, 1919. H. S. Bishton, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	376.75	374.55	374.26	374.78	374.42	374.45	375.00	375.18	375.20	377.10	377.90
2	377.05	374.70	374.22	374.76	374.42	374.45	375.00	375.16	375.20	377.00	378.40
3	377.75	374.62	374.24	374.77	374.42	374.45	375.00	375.06	375.20	377.10	378.85
4	376.60	374.55	374.22	374.76	374.42	374.46	375.00	375.03	375.20	377.10	379.75
5	376.14	374.52	374.22	374.76	374.42	374.46	375.00	375.10	375.25	377.10	380.00
6	375.90	374.55	374.22	*a*	374.42	374.46	375.20	375.08	375.28	377.10	380.40
7	375.16	374.55	374.19	*a*	374.40	374.46	375.20	374.86	375.25	377.10	380.60
8	375.55	374.65	374.21	*a*	374.40	374.47	375.30	374.70	375.30	377.20	380.60
9	375.32	374.55	374.24	*a*	374.40	374.47	375.30	374.70	375.40	378.00	380.70
10	375.18	374.42	374.22	*a*	374.40	374.47	375.30	374.70	375.40	378.10	380.80
11	375.65	374.48	374.26	*a*	374.40	374.47	375.32	374.72	375.45	379.70	380.80
12	376.20	374.42	374.12	*a*	374.40	374.49	375.90	374.70	375.50	380.80	380.80
13	375.92	374.28	374.06	*a*	374.40	374.49	375.85	374.70	375.48	380.90	380.80
14	375.75	374.30	374.04	*a*	374.35	374.48	375.85	374.72	375.50	380.90	380.70
15	375.58	374.24	374.04	374.75	374.40	374.48	375.80	374.74	375.50	380.90	380.70
16	375.58	374.24	374.05	374.80	374.40	374.48	375.80	374.75	375.50	380.70	380.60
17	375.38	374.24	374.05	374.80	374.38	374.48	375.90	374.74	375.50	380.50	380.50
18	375.22	374.22	374.07	374.72	374.40	374.48	375.90	374.81	375.50	380.40	380.40
19	375.18	374.21	374.06	374.71	374.35	374.48	375.90	374.86	375.50	380.20	380.40
20	375.25	374.14	374.06	374.44	374.30	374.48	375.88	374.95	375.48	380.15	380.35
21	375.12	374.18	374.08	374.46	374.30	374.48	375.90	375.00	376.00	379.35	380.30
22	375.12	374.17	374.14	374.42	374.32	374.48	375.90	375.10	376.10	379.75	380.30
23	375.08	374.21	374.18	374.44	374.33	374.48	375.86	375.10	376.20	378.30	380.19
24	375.12	374.22	374.25	374.44	374.35	374.48	375.82	375.10	376.25	378.50	380.12
25	374.90	374.25	374.20	374.46	374.40	374.49	375.80	375.10	376.30	377.10	*a*
26	375.08	374.40	374.18	374.55	374.45	374.48	375.80	375.10	376.40	377.30	*a*
27	374.80	374.32	374.24	374.50	374.45	374.48	375.59	375.10	376.40	377.50	*a*
28	374.58	374.24	374.24	374.48	374.45	374.48	375.54	375.10	376.50	377.80	*a*
29	374.62	374.20	374.24	374.44	374.45	374.73	375.50	......	376.50	377.80	*a*
30	374.55	374.23	374.24	374.43	374.44	374.73	375.48	......	376.90	377.70	*a*
31	374.68	374.24	......	374.42	......	374.78	375.33	......	377.05	......	*a*

a No record. NOTE.— Station discontinued May 31. 1919,

MOHAWK RIVER ABOVE STATE DAM, LITTLE FALLS

Gage No. 147

This station, established February 4, 1904, is located just above the upper, or State dam on the Mohawk river at Little

Falls. A staff gage, attached to the west wing-wall of the culvert over the stream from a waste-weir of the old Erie canal and about 400 feet upstream from the Hanson avenue bridge over the old canal feeder, was used until October 1, 1916. From that date until July 5, 1917, the concrete gate on the south wall of the Little Falls guard-gate was used. On July 5, 1917, a standard Type A gage was secured to the upper return wall of the south abutment of the guard-gate. This gage has a range of 12 feet, between elevations 360.0 and 372.0. A standard bench-mark plug was set in the wall near the gage at elevation 371.0 (B. C. datum). The State dam with crest averaging about elevation 363.0 is not affected by Barge canal construction.

Readings are taken twice daily — at 8 A. M. and 4 P. M. — to tenths, with occasional readings to half-tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER ABOVE STATE DAM AT LITTLE FALLS, for the year ended June 30, 1919. Albert H. Wilson, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	364.35	363.55	363.75	363.85	366.05	364.15	364.45	364.20	365.92	364.40	64.32	363.95
2	364.12	363.55	363.55	363.75	365.15	364.10	365.80	364.35	364.60	364.38	364.90	363.70
3	364.02	363.55	363.40	364.10	365.00	364.15	365.10	364.10	364.50	364.40	365.10	363.85
4	363.85	363.55	363.50	364.15	364.40	364.20	364.80	364.10	364.50	364.48	364.55	363.85
5	363.75	363.50	363.45	364.05	364.65	364.85	364.70	364.10	364.68	364.52	365.00	363.88
6	363.60	363.65	363.65	364.20	364.35	364.45	364.70	364.05	364.48	364.85	364.45	363.85
7	363.60	363.80	363.65	365.15	364.25	364.45	364.40	364.05	364.12	364.82	364.52	363.82
8	363.55	363.75	363.55	364.60	364.15	364.45	364.40	364.00	363.98	364.82	364.38	363.75
9	363.55	363.85	363.55	364.45	364.05	364.80	364.50	363.90	364.12	365.08	364.45	363.70
10	363.65	364.00	363.65	364.10	364.20	365.40	364.40	363.90	364.15	365.55	364.40	363.65
11	363.80	363.60	363.45	363.90	364.10	364.40	364.40	363.90	364.90	365.80	365.08	363.70
12	363.75	363.55	363.50	363.95	364.00	364.50	364.40	363.85	364.40	367.50	365.38	363.65
13	363.95	363.45	363.85	363.85	363.95	364.60	364.45	363.92	364.52	367.25	365.10	363.65
14	364.10	363.40	363.90	363.98	363.85	364.75	364.40	364.08	364.10	365.95	364.92	363.58
15	364.10	363.45	363.65	363.95	363.90	365.80	364.40	364.35	363.95	365.25	364.45	363.65
16	364.00	363.45	363.55	364.05	363.85	365.35	364.40	364.40	364.08	364.92	364.32	363.70
17	364.00	363.60	364.05	363.90	364.05	364.85	364.40	364.00	364.42	364.85	364.18	363.70
18	363.78	363.55	364.15	364.00	364.25	364.75	364.40	364.00	365.42	364.88	364.90	363.65
19	363.85	363.45	364.10	363.85	364.90	364.70	364.40	363.90	364.88	364.75	365.25	363.58
20	363.80	363.35	363.90	363.80	364.30	364.70	364.42	363.82	364.60	364.62	365.10	363.65
21	363.80	363.45	364.18	365.02	364.35	364.60	364.32	363.85	364.65	364.50	364.55	363.60
22	363.58	363.55	364.30	364.45	364.55	364.80	364.22	363.92	364.60	364.48	365.08	363.60
23	363.55	363.45	364.25	364.40	364.40	365.30	365.10	363.95	364.28	364.38	365.05	363.60
24	363.50	363.55	363.85	364.10	364.40	365.30	365.05	363.85	364.28	364.48	364.58	363.65
25	363.55	363.50	363.95	364.00	364.35	365.45	364.75	363.85	364.15	364.42	364.32	363.58
26	363.55	363.45	364.32	364.50	364.20	365.15	364.35	363.90	364.12	364.32	364.28	363.55
27	363.52	363.45	364.10	364.95	364.25	364.80	364.18	363.82	364.12	364.40	364.22	363.65
28	363.50	363.45	363.90	364.38	364.30	364.55	364.20	363.90	365.10	364.45	364.25	363.70
29	363.45	363.35	364.10	364.30	364.35	364.40	364.25	......	364.60	364.48	364.12	363.75
30	363.45	363.35	363.80	364.85	364.30	364.40	364.22	......	364.50	364.35	364.00	363.60
31	363.52	363.35	......	366.30	......	364.40	364.20	......	364.48	......	363.95	......

MOHAWK RIVER BELOW LOCK No. 17, LITTLE FALLS

This station is located on the Mohawk river at the lower end of lock No. 17 in the city of Little Falls. It is about 3.7 miles above and at the head of the canalized pool formed by the Rocky Rift dam and about 0.9 mile above the suspension bridge. The concrete vertical staff gage at the lower end of the lock is read once daily — at noon — to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER BELOW LOCK No. 17, LITTLE FALLS, for the year ended June 30, 1919. Harry L. Crouse and A. H. Wilson, Observers

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	322.4	326.2	324.0	321.7	321.4	323.5	321.8	321.8	320.7
2	322.2	325.2	323.7	324.1	322.8	322.5	321.8	322.4	320.8
3	322.3	324.5	323.7	323.2	321.0	321.8	321.7	322.8	322.4
4	323.0	324.0	323.8	322.5	321.1	321.5	322.1	322.3	322.4
5	322.5	324.2	324.0	322.3	321.1	322.3	322.5	322.5	322.5
6	322.8	323.7	324.0	322.1	321.0	321.9	322.7	322.4	322.6
7	324.6	323.8	324.1	321.4	321.0	321.5	322.4	322.1	322.7
8	324.2	323.5	324.1	322.3	320.9	320.9	322.4	322.4	322.5
9	324.0	323.4	324.5	322.0	320.8	321.0	323.1	322.1	322.7
10	323.6	323.3	324.4	322.0	320.9	323.0	323.6	322.0	322.5
11	322.9	323.3	323.9	321.4	320.9	322.5	324.2	323.2	322.5
12	323.0	323.3	324.1	321.6	320.9	321.5	327.45	323.4	322.5
13	323.7	323.3	323.9	321.5	321.0	321.9	326.8	323.1	322.5
14	323.2	323.2	324.7	321.5	321.0	321.5	324.7	323.5	322.4
15	323.4	323.4	326.8	321.8	321.4	321.1	323.4	321.9	322.5
16	323.7	323.1	326.8	321.8	321.6	321.0	323.0	321.7	322.5
17	323.5	323.4	324.7	321.8	321.2	322.0	322.8	321.3	322.5
18	323.3	324.0	323.9	321.5	321.2	323.7	322.8	322.7	322.6
19	323.4	324.1	323.8	321.6	321.0	322.5	322.5	323.4	322.5
20	323.2	324.0	322.7	321.5	320.8	321.9	322.4	322.8	322.5
21	325.45	323.9	322.1	321.6	320.8	322.2	321.9	322.2	322.4
22	324.9	324.0	321.9	321.7	320.8	321.8	321.8	321.9	322.5
23	324.0	324.0	323.5	321.6	320.8	321.5	321.8	322.2	322.5
24	323.4	323.7	322.7	323.7	320.7	321.5	321.8	322.2	322.5
25	322.8	324.2	323.6	322.8	320.7	321.4	321.9	322.0	322.5
26	323.5	323.9	323.5	322.2	320.8	321.4	321.6	321.8	322.5
27	324.5	323.9	322.7	321.5	321.0	321.3	321.5	322.0	322.5
28	323.7	323.5	321.9	321.6	320.8	322.5	321.8	321.7	322.5
29	323.5	324.0	321.7	321.4	......	321.8	321.7	321.4	322.5
30	324.0	324.0	321.5	321.5	......	322.1	321.5	321.1	322.5
31	327.1	......	321.6	321.4	......	322.0	......	321.1	......

NOTE.— Transferred from "Above Rocky Rift Dam, No. 12," April 1, 1916. Regular daily readings began October 1, 1918.

BARGE CANAL AT INDIAN CASTLE

Gage No. 145

This station indicates the water-surface in the Barge canal above the guard-gate at Indian Castle, about 5 miles east of Little Falls. Castle creek enters the Barge canal from the south, just west, or above the guard-gate, and is diverted westward through the canal land-line about 3,400 feet, entering the Mohawk river just above the Rocky Rift dam. Low navigable surface in this section of the canal is at elevation 322.5.

A vertical staff gage on the upstream, or west face of the guard-gate is read at irregular intervals.

Daily elevation of water-surface (B. C. datum) of BARGE CANAL ABOVE GUARD-GATE, INDIAN CASTLE, for the year ended June 30, 1919. Harry L. Crouse, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	323.1	322.9							322.8			
2	323.5	322.9									322.0	
3	323.5	322.7							321.8			
4	323.3	322.7										
5	323.1	322.7								322.3		
6	323.0	322.9										
7	322.9	323.0										
8	322.9	322.9						321.0	321.3			
9	322.9	323.8										
10	323.5								322.8		321.1	
11	323.3									323.7		
12	323.6											
13	323.4											
14	323.5											
15	323.9							321.4	321.1			
16	323.7											
17	323.2								321.8			
18	323.5								323.3			
19	323.3											
20	323.3											
21	323.2											
22	322.9							320.9	322.1			
23	323.2											
24	323.1											
25	322.9											
26	322.8									321.7		
27	322.6											
28	322.5											
29	322.5								322.0			
30	322.6											
31	323.0											

NOTE.— Station discontinued June 30, 1919.

MOHAWK RIVER AT ST. JOHNSVILLE

Gage No. 144

This station, established January 22, 1913, is located at the highway bridge crossing the Mohawk river at the village of St. Johnsville. It is about 1.3 miles below the Mindenville retention dam opposite Barge canal lock No. 16 and about 5.3 miles above the movable dam (No. 11) at Fort Plain. A standard chain gage attached to the upstream side of the bridge is read twice daily — at about 8 A. M. and 4 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT ST. JOHNSVILLE, for the year ended June 30, 1919. H. C. Dowling, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	302.75	302.4	302.25	301.3	303.85	302.35	297 25	295.9	298.7	297.85	301.5
2	302.2	302.35	302.0	302.2	302.95	301.75	301.5	296.2	298.25	297.75	302.4
3	302.5	302.45	302.1	302.35	302.75	301.55	299.1	296.05	297.55	297.5	302.75
4	302.2	302.35	302.05	302.35	302.75	301.75	298.4	296.1	297.45	297.95	301.85
5	302.3	302.55	302.3	302.2	302.6	302.3	297.3	296.05	298.45	299.0	302.5
6	302.05	302.35	302.15	302.15	302.25	301.7	297.0	295.85	297.8	299.1	302.05
7	302.25	302.7	302.0	303 3	302.35	301 6	296.7	295.65	296.8	2 9.25	302.2
8	302.35	02.15	302.3	302.25	302. 5	299.25	296.85	295.5	296.05	299.55	302.35
9	302.35	302.55	302.2	302.45	302.05	298.25	296.85	295.45	296.7	300.45	302.0
10	302.8	302.55	302 1	302.25	302.3	298.15	296.6	295.45	299.8	300.9	301.9
11	302.35	302.0	302.2	301.95	302.25	297.3	296.5	295.55	298.9	301.75	303.1
12	302.5	30 .0	302.15	302.15	302.15	297.45	296.55	295.7	297.6	305.4	302.8
13	302.4	302.0	302.4	302.05	302.1	297.2	296.6	295.65	297.95	304.55	302.7
14	302.4	301.95	302.2	302.2	302.0	297.6	296.65	295.8	297.15	302.0	302.3
15	302.7	302.2	302.05	302.25	301.95	301.45	296.7	296.3	296.5	301.05	300.2
16	302.65	302.25	302.1	302.2	302.4	300.2	296.6	296.05	296.1	300.5	302.05
17	302.35	302.05	302.35	302.05	301.85	298.7	296.55	296.05	297.8	300.45	301.5
18	302.5	302.5	302.35	302.0	302.9	297.95	296 4	296.0	300.7	301.2	302.95
19	302.35	302.35	302.35	301.95	302.85	297.6	296.05	296.35	299.6	301.1	302.85
20	302.4	302.15	302.00	301.95	302.1	297.35	296.4	297.7	299.25	300.5	302.0
21	302.3	302.35	302.75	303.2	302.9	296.9	296.2	297.0	299.5	300.55	302.15
22	302.45	302.4	302.1	302.6	302.05	296.15	296.2	297.55	299.25	301.45	302.1
23	302.2	302.4	302.1	302.55	302.15	302.15	296.2	295.5	298.5	300.75	302.35
24	302.3	302.35	302.1	302.8	302.1	300.45	298.4	295.2	298.35	300.55	302.15
25	302.45	302.4	302.15	302.3	302.55	302.6	298.55	295.6	297.85	301.05	302.05
26	302.25	302.35	303.0	302.6	301.9	301.15	297.35	295.55	297.65	301.05	302.05
27	302.25	302.05	302.25	302.85	301.8	299.1	296.7	295.55	297.45	301.1	302.05
28	301.9	302.1	302.65	302.25	301.7	297.9	296.3	295.4	300.5	301.85	301.75
29	301.8	302.2	302.2	301.8	302.4	297.2	296.25	......	298.85	302.25	301.8
30	302.55	302.35	301.9	302.9	302.5	297.15	296.15	......	298.45	301.75	301.55
31	302.55	302.1	......	305.85	......	297.35	296.2	......	298.35	......	301.85

NOTE.— Station discontinued May 31, 1919.

MOHAWK RIVER AT FORT PLAIN

Gage No. 143

This station, established December 30, 1905, is located at the River street highway bridge over the Mohawk river, connecting the villages of Fort Plain and Nelliston. It is about 0.4 mile below the movable dam (No. 11) at Fort Plain and about 2.9 miles above the movable dam (No. 10) at Canajoharie. The gage is a standard chain secured to the downstream side of the bridge, about 50 feet from the south, or right abutment and is read twice daily — at about 8 A. M. and 5 P. M.— to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT FORT PLAIN, for the year ended June 30, 1919. Clark Keyser, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	294.35	294.05	294.6	294.2	295.3	293.75	288.9	286.9	293.15	288.95	293.75
2	294.45	294.25	294.25	294.3	294.55	293.75	293.25	286.85	291.9	288.65	294.75
3	294.45	294.4	294.35	294.5	294.65	294.25	291.15	288.9	289.8	288.6	295.2
4	294.35	293.8	294.35	294.35	294.6	294.05	289.55	288.75	289.2	289.2	295.2
5	294.25	294.3	294.3	294.35	294.45	293.85	288.75	288.55	290.05	290.2	294.95
6	294.15	294.3	294.35	294.55	294.6	293.95	288.5	288.95	289.4	290.45	294.65
7	294.15	294.55	294.45	295.25	294.65	294.0	288.05	288.65	288.15	290.65	294.85
8	294.45	293.9	294.4	294.75	294.35	293.35	288.2	288.85	287.75	291.1	295.05
9	294.3	294.5	294.55	294.85	294.65	290.85	287.7	289.35	288.5	292.05	294.8
10	294.3	294.35	294.5	294.8	294.55	289.55	287.85	289.95	291.2	292.4	295.15
11	294.6	294.45	294.65	294.55	294.5	289.5	287.7	291.5	290.3	292.95	295.25
12	293.9	294.5	294.45	294.55	294.35	289.3	288.85	290.95	289.2	297.1	294.45
13	294.45	294.2	294.65	294.55	294.45	288.65	292.45	290.65	289.3	296.4	295.2
14	294.45	294.3	294.45	294.6	294.35	289.15	293.05	290.85	288.65	293.3	294.75
15	294.2	294.3	294.35	294.65	294.25	291.9	292.85	290.85	287.85	291.05	294.75
16	294.3	294.6	294.25	294.85	294.4	291.35	292.0	292.0	288.85	290.9	294.65
17	294.25	293.95	294.35	294.45	294.45	289.8	291.55	293.05	289.3	292.45	294.2
18	294.55	294.1	294.62	294.35	294.9	288.95	290.9	291.6	291.9	292.85	294.55
19	294.45	294.45	294.45	294.55	294.55	288.45	290.5	289.95	291.05	292.55	294.95
20	294.55	294.1	294.45	294.75	294 65	288.2	290.55	289.85	290.6	292.3	295.05
21	294.45	294.35	294.6	295.6	294.05	287.95	290.15	290.15	291.15	292.4	294.6
22	294.25	294.55	294.55	294.6	294 2	287.75	289.65	289. 5	290.85	293.25	295.05
23	293.9	294.2	294.35	294.3	294.25	292.9	289.7	290.05	290.35	293.45	294.65
24	294.05	294.1	294.4	293.8	294.0	292.65	290.8	289.95	289.8	293.7	295.1
25	294.05	294.15	294.25	294.45	294.4	292.55	291.55	288.95	289.45	294.5	294.85
26	294.1	294.35	294.5	294.95	293.95	291.9	290.3	288.9	289.25	293.9	294.65
27	294.0	294.05	294.6	294.75	294.1	290.3	289.25	291.4	289.3	293.55	294.75
28	293.9	294.05	294.9	294.7	294.25	289.35	288.15	291.45	291.9	293.75	294.55
29	293.8	294.15	294.6	295.15	294.45	288.7	288.05	......	290.35	294.05	294.4
30	294.45	294.4	294.15	297.3	294.2	288.15	287.85	......	289.8	293.95	294.4
31	294.15	294.4	......	295.55	......	288.4	287.35	......	289.55	......	294.45

NOTE.— Station discontinued May 31, 1919.

MOHAWK RIVER AT CANAJOHARIE

Gage No. 142

This station, established September 16, 1908, is located at the highway bridge over the Mohawk river connecting the villages of Canajoharie and Palatine Bridge. It is about 1,900 feet below the movable dam (No. 10) at Canajoharie. A standard chain gage attached to the bridge is read twice daily — at 9 A. M. and 3 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT CANAJOHARIE for the year ended June 30, 1919. Guy Bracebridge, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	285.42	285.32	285.42	285.42	287.52	285.72	282.12	283.22	284.12	282.92	286.42
2	285.42	285.22	285.42	285.42	286.42	285.82	283.92	28 .52	283.52	281.32	286.52
3	285.32	285.32	285.32	285.42	286.22	285.82	283.92	283.52	281.92	281.52	286.42
4	285.22	285.32	285.42	285.42	286.22	285.52	282.12	283.52	281.92	282.12	286.42
5	285.22	285.52	285.42	285.42	285.52	285.52	282.12	283.12	282.92	282.12	286.42
6	285.22	285.52	285.52	285.42	285.52	285.42	281.12	283.12	281.52	282.12	286.12
7	285.32	285.52	285.52	285.42	285.52	285.12	280.72	283.12	280.62	283.72	286.12
8	285.22	285.42	285.52	285.12	285.52	285.12	280.52	283.12	280.62	283.92	286.12
9	285.42	285.52	285.52	286.02	285.52	285.12	280.52	281.82	282.52	284.52	285.92
10	285.42	285.52	285.52	285.82	285.52	281.52	280.52	281.12	282.52	285.32	285.72
11	285.42	285.52	285.52	285.82	285.12	281.52	280.52	280.52	282.92	286.12	286.72
12	285.42	285.32	285.52	285.82	285.12	281.52	283.12	280.52	282.92	291.12	286.72
13	285.42	285.32	285.52	285.72	285.12	281.52	283.52	280.52	282.52	289.12	286.42
14	285.52	285.32	285.52	285.52	284.82	281.62	284.52	281.52	281.82	286.12	286.12
15	286.12	285.52	285.52	285.52	285.52	285.52	284.52	281.92	279.92	282.82	286.12
16	285.42	285.52	285.92	285.52	285.52	285.52	284.12	280.52	281.22	283.52	285.92
17	285.42	285.52	286.12	285.42	284.82	285.12	283.52	280.52	282.12	284.52	285.72
18	285.42	285.52	285.92	285.52	285.52	281.52	283.52	280.22	282.12	284.32	285.82
19	285.42	285.52	285.92	285.52	286.42	281.42	282.42	280.22	284.42	283.92	286.12
20	285.42	285.42	285.92	285.92	286.42	281.52	282.32	280.02	284.42	283.72	286.12
21	285.52	285.42	285.92	286.82	286.22	281.52	282.12	280.02	283.52	284.22	286.12
22	285.52	285.42	285.72	286.02	285.52	281.52	282.22	280.02	282.12	284.22	286.42
23	285.52	285.52	285.72	285.52	285.52	281.82	283.12	280.02	282.12	284.52	286.42
24	285.52	285.52	285.52	285.52	285.52	281.82	284.42	280.02	282.12	284.52	286.42
25	285.52	285.42	285.42	285.52	285.52	281.82	284.42	280.02	282.12	284.22	286.12
26	285.52	285.42	286.52	286.02	285.52	281.82	283.52	280.22	282.12	284.22	285.72
27	285.52	285.42	286.52	286.22	285.52	281.82	283.12	280.42	282.22	285.92	285.72
28	285.52	285.42	285.52	286.02	285.52	281.82	282.42	280.42	282.22	285.92	285.72
29	285.52	285.42	285.42	286.02	285.52	281.02	282.82	......	283.12	286.12	285.72
30	285.52	285.42	285.42	286.42	285.52	280.92	282.82	......	282.92	286.12	285.82
31	285.42	285.42	......	290.82	......	280.92	283.22	......	282.92	......	285.82

NOTE.— Station discontinued May 31, 1919.

MOHAWK RIVER AT FONDA

Gage No. 141

This station, established April 29, 1906, is located at the highway bridge over the Mohawk river connecting the villages of Fonda and Fultonville. This bridge is about 4.6 miles below movable dam No. 9, near Yosts, and about 5 miles above movable dam No. 8 and the mouth of Schoharie creek at Tribes Hill.

Previous to 1913 discharge was computed at this station, but this was discontinued, owing to the destruction of the control, due to Barge canal construction work, and the station has since been maintained for surface elevations only.

A standard chain gage, No. 141, attached to the downstream side of the middle span of the bridge was read twice daily — A. M. and P. M.— to tenths, except Sundays, when it was read once — P. M.— only.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT FULTONVILLE BRIDGE, FONDA, for the year ended June 30, 1919. Richard Kilmartin, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	278.2	278.3	278.1	278.35	279.4	278.5	273.3	272.95	273.45	274.95	278.05	278.4
2	278.05	278.35	278.35	278.35	278.8	278.35	277.55	273.0	275.6	274.85	278.4	278.6
3	278.5	278.55	278.55	278.45	278.8	278.0	276.35	273.0	274.9	274.55	278.9	278.5
4	278.4	278.3	278.45	278.35	279.05	278.0	276.4	273.1	274.25	274.5	278.6	278.5
5	278.45	278.25	278.45	278.5	*a*	278.1	275.6	272.7	275 1	275.4	278.9	278.3
6	278.45	278.55	278.35	278.8	278.2	278.35	273.45	272.8	274.9	275.6	278.6	278.45
7	278.4	278.4	278.3	278.9	278.25	277.75	273.4	272.65	274.45	275.85	278.35	278.4
8	278.45	278.05	278.3	278.5	278.35	277.4	273.25	272.5	273.0	276.0	278.8	278.0
9	278.35	278.3	278.15	278.55	278.45	277.1	273.65	272 2	277.0	276.25	278.65	277.6
10	278.6	278.35	278.55	278.25	278.4	277.25	273.05	272.0	276.45	276.85	278.95	278.05
11	278.25	278.4	278.55	278.4	*a*	276.2	272.9	272.35	275.75	277.85	279.5	278.35
12	278.4	278.35	278.65	277.9	278.25	273.45	273.0	272.4	274.3	281.35	278.75	278.35
13	278.45	278.4	278.6	278.2	278.45	273.35	272.9	272.4	274.2	280.9	278.9	278.05
14	278.5	278.45	278.45	278.45	278.3	273.7	273 3	272.55	273.9	278.7	278.35	278.0
15	278.55	278.1	278.5	278.35	278.05	275.8	273.35	272.2	273.25	276.55	278.2	278.2
16	278.7	278.35	278.35	278.45	278.25	276.35	273.35	273.0	273.5	275.6	278.15	278.8
17	278.1	278.45	278.5	278.35	278.6	274.9	273.6	272.7	274.7	275.7	278.55	278.5
18	278.45	278.3	278.8	278.15	279.1	274.15	273.4	272.85	276.3	276.05	279.1	278.35
19	278.25	278.35	278.45	278.2	278.65	273.5	273.4	272.65	276.15	276.45	279.25	278.55
20	278.45	278.25	278.6	278.2	278.55	273.4	273.3	272.45	276.45	276.7	278.5	278.4
21	278.2	278.35	278.7	278.5	278.65	273.35	273.05	272.15	276.55	277.1	278.5	278.55
22	278.35	278.25	278.7	278.55	279.1	274.0	273.15	271.8	276.25	278.0	278.45	278.5
23	278.4	278.25	278.55	278.05	278.55	276.55	273.1	271.7	275.6	278.25	278.7	277.65
24	278.15	278.35	278.65	278.0	278.5	277.1	274.25	271.5	274.65	278.4	278.6	277.85
25	278.35	278.0	278.7	278.35	278.3	*a*	274.15	271.75	274.4	278.6	278.5	278.2
26	278.55	277.85	278.7	278.35	278.0	277.65	274.0	272.05	274.35	278.65	278.35	278.35
27	278.25	278.15	278.5	279.0	278.45	275.4	273.65	272.2	*a*	278.1	278.2	278.6
28	278.4	278.25	278.75	278.5	278.6	274.4	273.3	272.3	*a*	278.25	278.3	278.8
29	278.25	278.45	278.3	278.45	278.75	274.0	273.45	......	275.55	278.7	278.2	278.5
30	278.05	278.35	278.05	278.75	278.65	273.4	273.45	......	275.5	278.6	*a*	278.35
31	278.35	278.35	......	282.0	......	273.3	273.05	......	275.45	......	*a*	......

a No record.

MOHAWK RIVER AT TRIBES HILL

Gage No. 140

This station, established January 7, 1904, is located at the suspension bridge over the Mohawk river connecting the villages of Tribes Hill and Fort Hunter. This bridge lies just below movable dam No. 8 at Tribes Hill and over the lower guide-wall of Barge canal lock No. 12.

Discharge was formerly computed at this station, but was discontinued because of the destruction of the control by Barge canal construction. The station is now maintained for water-surface elevations only. The gage is a standard chain, attached to the downstream side of the bridge near the left bank or north end and is read twice daily — at about 8 A. M. and 4 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT TRIBES HILL for the year ended June 30, 1919. A. W. Van Vliet, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	267.00	267.00	266.85	267.05	268.20	267.35	262.70	262.10	264.15	264.40	266.95	267.55
2	267.05	267.00	267.20	267.10	267.35	266.90	267.80	261.20	266.15	263.95	267.60	267.50
3	267.05	267.05	267.20	267.35	267.30	267.05	266.50	261.60	264.65	263.60	267.55	267.10
4	267.05	267.10	267.25	267.05	267.45	266.90	264.80	261.80	263.85	264.75	267.45	267.30
5	267.15	266.65	267.20	267.20	267.50	266.95	263.40	261.80	264.80	265.75	267.65	267.35
6	267.30	267.15	267.15	266.65	267.05	267.20	262.85	261.70	264.80	266.80	267.40	267.45
7	266.95	267.10	267.10	267.20	266.90	267.15	262.70	261.50	263.35	266.70	267.50	267.45
8	267.10	266.75	267.25	267.40	267.40	266.60	262.75	261.20	262.40	266.80	267.60	267.25
9	267.20	266.65	267.15	267.50	267.10	266.85	262.80	260.85	262.70	267.00	267.20	267.20
10	267.25	267.30	267.25	267.05	267.35	265.55	261.95	260.70	267.25	267.00	267.30	267.35
11	267.10	267.15	267.30	267.15	267.20	265.20	261.75	260.70	265.90	267.55	268.60	267.30
12	267.10	267.35	267.35	266.90	267.20	262.90	261.60	260.80	264.30	270.50	267.90	267.35
13	267.25	267.20	267.40	267.20	267.15	262.90	263.65	260.45	264.25	269.85	269.05	267.25
14	267.05	267.20	267.20	267.30	267.05	262.90	264.50	260.90	263.75	270.50	267.55	267.20
15	267.10	267.05	267.20	267.15	267.05	266.00	264.60	261.85	262.85	266.50	267.65	267.40
16	267.35	267.25	267.05	267.25	266.85	266.25	264.40	262.60	262.10	264.85	267.60	267.35
17	267.15	267.20	267.25	267.40	267.00	264.65	264.10	261.40	264.05	265.70	267.40	266.95
18	267.30	267.05	267.30	267.10	267.10	263.70	264.00	261.50	266.85	265.65	268.55	267.00
19	267.15	267.00	267.20	267.30	267.10	262.85	263.75	261.00	266.60	265.50	268.10	267.30
20	267.00	267.20	267.35	267.15	267.30	262.70	263.20	260.70	265.70	264.65	267.60	267.10
21	267.00	267.20	267.30	267.75	267.15	262.55	263.70	260.80	266.10	265.10	267.25	267.25
22	266.80	267.10	267.15	267.50	267.00	261.95	263.25	260.50	266.10	265.70	267.55	267.20
23	267.05	267.10	267.00	267.35	267.25	265.70	263.10	260.70	265.15	267.05	267.60	266.85
24	267.15	267.15	267.05	267.10	267.00	266.45	264.10	260.55	264.60	267.40	267.75	267.10
25	267.15	267.00	267.25	266.95	267.45	268.35	264.70	260.85	264.15	267.40	267.55	267.05
26	267.15	266.90	267.20	267.10	267.05	267.45	263.95	260.95	264.05	267.50	267.50	267.00
27	267.05	266.90	267.50	267.45	267.30	265.50	264.05	261.40	263.55	267.30	267.40	267.25
28	267.10	267.05	267.50	267.35	267.25	264.30	263.00	261.10	266.45	267.30	267.35	267.35
29	267.05	267.25	267.10	267.40	267.30	263.25	262.85	......	265.60	267.45	267.10	267.35
30	266.60	267.30	267.05	267.50	267.10	262.70	262.60	......	265.05	267.45	267.35	267.00
31	267.15	267.05	......	270.10	......	262.60	262.40	......	264.95	......	267.35	......

MOHAWK RIVER AT SCHENECTADY

Gage No. 139

This station, established April 3, 1904, is located at the Washington avenue bridge over the Mohawk river between Schenectady and Scotia, commonly known as the Scotia bridge. The original staff gage, secured to the downstream end of the first pier from the east bank, was replaced on April 12, 1917, by a standard Type A gage, No. 139, in the same location, having a range of 24 feet, between elevations 208.0 and 232.0. A standard benchmark plug is set near the gage at elevation 220.0 (B. C. datum). The gage is read twice daily — A. M. and P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT SCHENECTADY for the year ended June 30, 1919. Peter Lebeis, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	212.0	211.55	211.55	211.85	213.85	212.2	212.2	212.0	212.45	208.8	211.9	211.8
2.....	212.1	211.55	211.55	211.85	212.85	211.6	212.75	211.9	213.5	208.4	212.3	211.85
3.....	211.85	211.55	211.5	211.9	212.5	212.1	213.75	211.9	212.9	208.4	212.75	211.65
4.....	211.65	211.55	211.55	212.0	212.55	211.9	212.8	211.9	212.65	208.7	212.3	211.85
5.....	211.7	211.6	211.6	212.0	212.3	211.7	213.0	211.95	212.75	209.95	212.6	211.8
6.....	211.7	211.6	211.6	211.8	212.0	*d*	212.3	211.95	212.85	212.0	212.5	211.75
7.....	211.55	211.55	211.75	212.35	211.95	*d*	212.3	211.9	212.45	212.6	212.5	211.85
8.....	211.55	211.7	211.5	212.3	212.15	*d*	212.3	211.85	212.2	212.75	212.7	211.8
9.....	211.6	211.5	211.5	211.85	211.9	*d*	212.5	211.8	212.2	212.6	212.45	211.7
10.....	211.8	211.75	211.5	212.0	212.0	*d*	212.15	211.8	213.9	212.8	212.5	211.7
11.....	211.8	211.55	211.55	211.95	211.7	*d*	212.2	211.8	213.3	213.2	214.15	211.75
12.....	211.85	211.7	211.55	211.6	211.9	*d*	212.0	211.8	212.7	215.85	214.1	211.65
13.....	211.85	211.5	211.8	211.75	211.9	*d*	212.0	211.8	212.6	215.8	214.3	211.65
14.....	211.9	211.65	211.55	211.8	211.7	*d*	211.9	211.8	212.55	214.3	213.05	211.6
15.....	212.15	211.5	211.65	211.8	211.6	212.35	212.0	211.9	212.45	212.7	212.6	211.85
16.....	211.9	211.6	211.5	211.85	211.8	213.55	212.15	212.1	212.15	210.6	212.45	211.9
17.....	211.9	211.5	211.7	211.8	211.8	212.15	212.1	212.0	212.35	211.0	212.75	211.9
18.....	211.9	211.55	211.8	211.75	212.35	*d*	212.1	211.9	213.65	213.25	213.0	211.75
19.....	211.85	211.5	211.8	211.7	212.45	*d*	212.1	211.8	213.75	212.75	213.3	211.7
20.....	211.7	211.55	211.9	211.65	212.6	212.25	212.0	211.8	213.15	212.35	212.45	211.6
21.....	211.75	211.5	212.0	213.05	212.3	212.15	212.05	211.8	213.3	212.4	212.45	211.7
22.....	211.7	211.5	211.8	212.45	212.2	212.0	212.1	211.8	213.35	212.3	212.55	211.6
23.....	211.6	211.5	211.6	212.15	212.3	212.65	212.0	211.8	213.0	212.45	212.85	211.6
24.....	211.6	211.55	211.75	211.9	211.9	213.45	212.1	211.75	212.45	212.3	212.85	211.6
25.....	211.7	211.5	211.8	211.8	212.2	214.8	212.7	211.8	212.6	212.15	212.75	211.65
26.....	211.65	211.5	212.8	212.2	211.8	214.3	212.5	211.8	212.3	212.3	212.65	211.5
27.....	211.6	211.5	213.0	212.5	211.95	213.15	212.35	211.85	209.6	212.2	212.55	211.6
28.....	211.6	211.5	212.65	212.25	211.95	212.6	212.3	211.9	211.8	212.05	212.15	211.6
29.....	211.55	211.5	212.0	212.2	211.85	212.3	212.2	......	212.2	212.3	211.95	211.6
30.....	211.55	211.5	211.85	212.35	212.15	212.1	212.1	......	209.35	212.2	211.95	211.6
31.....	211.55	211.7	......	215.25	......	212.2	212.05	......	209.4	......	211.7	......

d Records doubtful.

MOHAWK RIVER AT REXFORD

Gage No. 138

This station, originally established by the United States Deep Waterways Commission December 8, 1898, and now maintained by this Department, is located on the Mohawk river at Rexford

(Aqueduct) about 3.7 miles below the N. Y. C. R. R. bridge at Schenectady. Previous to January 20, 1915, a chain gage was located on the right, or south abutment, a few feet above the crest of the old State dam. Beginning January 20, 1915, a staff gage on the upstream side of the south abutment of the old Erie canal aqueduct 800 feet below the dam was used. On January 24, 1917, this gage was replaced by a standard Type A gage, No. 138, at the same location, having a range of 20 feet, between elevations 210.0 and 230.0 A standard bench-mark plug is set near the gage at elevation 216.0 (B. C. datum).

The old State dam with crest at elevation 209.5 has been entirely removed.

The gage is read twice daily — usually at 8 A. M. and 4 P. M.— to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT CANAL AQUEDUCT, REXFORD, for the year ended June 30, 1919. J. Reepmeyer, Jr., Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	211.6	211.4	211.3	211.6	213.0	212.0	212.0	212.0	212.45	a	212.1	211.4
2	211.6	211.4	211.4	211.6	213.0	212.0	212.3	212.0	212.7	a	212.1	211.4
3	211.6	211.4	211.4	211.8	212.6	211.7	212.05	212.0	212.55	a	212.1	211.3
4	211.7	211.4	211.3	212.2	212.2	211.3	212.0	212.0	212.35	a	212.2	211.3
5	211.6	211.4	211.3	212.2	212.0	211.0	212.0	212.0	212.3	a	212.3	211.3
6	211.6	211.4	211.3	212.2	211.8	211.0	212.0	212.0	212.3	a	212.25	211.3
7	211.6	211.4	211.3	212.1	211.8	211.0	212.0	212.0	212.1	211.6	212.3	211.3
8	211.6	211.4	211.4	212.0	211.8	211.0	212.0	212.0	212.0	211.45	212.25	211.3
9	211.6	211.4	211.4	211.9	211.8	211.0	212.0	212.0	212.3	211.4	212.2	211.35
10	211.5	211.8	211.4	211.9	211.8	211.0	212.0	212.0	212.4	211.4	212.2	211.35
11	211.5	211.4	211.4	211.9	211.8	211.0	212.0	212.0	212.4	212.65	212.7	211.4
12	211.5	211.4	211.4	211.9	211.8	211.0	212.0	212.0	212.6	214.55	213.25	211.45
13	211.5	211.4	211.6	212.0	211.8	211.2	212.0	212.0	212.6	212.0	212.9	211.4
14	211.5	211.4	211.5	212.1	211.8	211.9	212.0	212.0	212.8	211.8	212.5	211.4
15	211.5	211.4	211.5	212.2	211.8	212.0	212.0	212.0	212.85	211.45	212.2	211.4
16	211.55	211.4	211.5	212.2	211.8	212.0	212.0	212.0	212.6	211.0	212.2	211.4
17	211.8	211.4	211.5	212.2	212.0	212.0	212.0	212.0	212.4	211.2	212.2	211.4
18	211.6	211.2	211.5	212.2	212.2	212.0	212.0	212.0	212.35	211.2	212.0	211.4
19	211.5	211.2	211.5	212.2	212.35	212.0	212.0	212.0	212.25	211.2	212.0	211.3
20	211.5	211.2	211.5	212.75	212.3	212.0	212.0	212.0	212.2	212.2	212.0	211.3
21	211.5	211.2	211.5	212.25	212.2	212.0	212.0	212.0	212.0	212.2	212.0	211.4
22	211.4	211.2	211.5	212.1	212.0	212.0	212.0	212.0	212.0	212.2	212.6	211.3
23	211.4	211.2	211.5	211.8	212.1	212.2	212.05	212.0	212.0	212.2	212.85	211.3
24	211.45	211.2	211.55	211.5	212.0	212.6	212.3	212.0	211.7	212.2	212.9	211.3
25	211.4	211.2	211.6	211.5	212.0	213.9	212.3	212.0	211.4	212.3	212.7	211.2
26	211.4	211.2	211.8	211.55	212.0	213.9	212.0	212.0	211.1	212.2	212.5	211.2
27	211.4	211.2	212.6	211.6	212.0	212.35	212.0	212.0	211.0	212.2	212.1	211.2
28	211.4	211.2	212.15	211.6	212.0	212.1	212.0	212.0	211.0	212.2	212.0	211.2
29	211.4	211.2	211.8	211.6	212.0	212.0	212.0	......	211.0	212.2	212.0	211.2
30	211.4	211.2	211.8	211.9	212.0	212.0	212.0	......	211.0	212.1	211.7	211.2
31	211.4	211.2	......	213.7	......	212.0	212.0	......	211.0	......	211.4	......

a No record.

MOHAWK RIVER ABOVE VISCHER FERRY DAM

Gage No. 137

This station was established June 24, 1913, by the U. S. Geological Survey and until March 1, 1915, gage heights, or elevations converted from automatic gage records, were published. Since March 1, 1915, a record has been kept by this Department in addition to that of the U. S. Geological Survey. The concrete gage at the upper end of lock No. 7 has been used for this purpose.

The gage is read four times daily to tenths, the hundredths in the table being due to the averaging of the readings.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER ABOVE VISCHER FERRY DAM, for the year ended June 30, 1919. J. J. Hannan, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	211.68	211.55	211.78	211.78	213.08	212.02	212.08	211.92	212.15	205.58	211.92	211.80
2	212.05	211.52	211.55	211.82	212.55	211.80	212.58	211.80	212.73	204.20	212.08	211.65
3	211.70	211.50	211.58	211.75	212.32	211.88	212.98	211.70	212.55	203.10	212.30	211.75
4	211.72	211.52	211.58	211.82	212.32	211.80	212.58	211.80	212.40	203.75	212.18	211.65
5	211.68	211.52	211.55	211.88	212.18	211.85	212.30	211.90	212.33	206.68	212.32	211.70
6	211.68	211.48	211.62	211.80	212.10	211.80	212.05	211.80	212.50	209.65	212.35	211.62
7	211.65	211.45	211.72	212.20	211.98	211.85	211.98	211.80	212.28	211.30	212.20	211.72
8	211.62	211.70	211.55	212.30	211.92	211.98	211.92	211.70	212.05	211.38	212.35	211.68
9	211.62	211.55	211.52	212.05	211.88	212.05	212.07	211.70	212.00	211.22	212.20	211.68
10	211.70	211.70	211.52	211.88	211.75	212.20	211.97	211.70	212.90	211.48	212.20	211.75
11	211.85	211.80	211.52	211.80	211.78	212.18	211.90	211.70	212.70	211.60	212.85	211.68
12	211.75	211.58	211.55	211.80	211.78	212.25	211.80	211.70	212.40	212.55	213.05	211.70
13	211.80	211.58	211.55	211.72	211.78	212.18	211.73	211.70	212.30	212.92	213.12	211.65
14	211.85	211.52	211.68	211.72	211.78	212.08	211.77	211.70	212.30	212.30	212.72	211.60
15	212.02	211.60	211.65	211.72	211.80	212.47	211.80	211.80	212.18	211.52	212.38	211.72
16	212.02	211.55	211.55	211.72	211.77	212.85	212.00	212.00	212.00	209.38	212.20	211.82
17	211.80	211.52	211.55	211.78	211.72	212.22	212.00	211.90	212.10	208.75	212.20	211.98
18	211.75	211.50	211.82	211.73	211.90	209.08	211.93	211.80	212.72	212.55	212.45	211.80
19	211.75	211.50	211.82	211.68	212.42	204.62	211.92	211.70	212.92	212.40	212.68	211.60
20	211.82	211.50	211.80	211.65	212.35	211.60	211.92	211.70	212.60	212.38	212.38	211.60
21	211.70	211.50	211.88	212.45	212.22	211.98	211.90	211.77	212.65	212.20	212.28	211.60
22	211.60	211.50	211.95	212.28	212.00	211.98	211.90	211.70	212.75	212.20	212.12	211.60
23	211.65	211.50	211.72	211.95	212.10	212.12	211.92	211.70	212.53	212.15	212.38	211.60
24	211.68	211.48	211.88	211.72	211.95	212.82	212.02	211.70	212.32	212.02	212.45	211.60
25	211.62	211.55	211.75	211.78	211.90	213.10	212.18	211.70	212.00	211.95	212.42	211.58
26	211.58	211.50	212.20	212.12	211.95	213.20	212.23	211.80	211.62	212.12	212.45	211.55
27	211.55	211.48	212.68	212.42	211.92	212.62	212.12	211.85	209.82	212.10	212.12	211.60
28	211.60	211.48	212.35	212.05	211.90	212.42	212.10	211.85	209.75	211.96	212.12	211.58
29	211.58	211.50	211.95	211.98	211.75	212.18	212.00	......	211.50	212.10	211.95	211.62
30	211.60	211.48	211.90	211.92	211.85	212.02	212.00	......	206.50	212.10	211.82	211.60
31	211.60	211.58	......	213.20	......	211.95	212.00	......	206.10	......	211.75	......

MOHAWK RIVER BELOW VISCHER FERRY DAM

Gage No. 136

This station, established May 1, 1916, is located below the Vischer Ferry dam on the Mohawk river and indicates the water-surface at the upstream end of the canalized pool formed by the Crescent dam. The vertical staff concrete gage on the lower end of Barge canal lock No. 7 is read four times daily to tenths, the hundredths in the table being due to the averaging of the readings.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER BELOW VISCHER FERRY DAM, for the year ended June 30, 1919. J. J. Hannan, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	184.70	184.48	184.72	184.88	186.28	184.95	185.15	185.08	185.18	185.62	185.12	184.85
2.....	185.18	184.48	184.48	184.85	185.72	184.85	185.62	184.85	186.30	185.38	185.25	184.88
3.....	184.80	184.40	184.50	184.78	185.58	184.90	186.30	184.80	185.88	185.30	185.42	184.82
4.....	184.80	184.48	184.45	184.95	185.50	184.98	185.92	184.80	185.62	185.42	185.38	184.80
5.....	184.70	184.50	184.48	185.00	185.30	184.92	185.60	184.80	185.50	185.75	185.50	184.88
6.....	184.72	184.40	184.58	184.90	185.18	184.82	185.35	184.80	185.72	186.05	185.52	184.70
7.....	184.68	184.42	184.72	185.35	185.15	184.88	185.20	184.80	185.50	186.25	185.38	184.82
8.....	184.60	184.70	184.65	185.45	185.00	185.05	185.18	184.70	185.22	186.30	185.50	184.80
9.....	184.60	184.52	184.50	185.12	185.02	185.05	185.10	184.70	185.13	186.30	185.32	184.72
10.....	184.70	184.88	184.50	185.05	184.95	185.18	184.93	184.70	186.20	186.35	185.30	184.78
11.....	184.92	184.72	184.50	184.93	184.88	185.22	184.83	184.70	186.03	186.40	186.08	184.72
12.....	184.82	184.52	184.52	184.72	184.80	185.30	184.80	184.60	185.70	187.25	186.55	184.70
13.....	184.82	184.65	184.58	184.85	184.82	185.22	184.80	184.60	185.50	187.85	186.68	184.70
14.....	184.95	184.50	184.80	184.72	184.80	185.20	184.93	184.60	185.42	187.18	186.12	184.70
15.....	185.05	184.72	184.68	184.82	184.80	185.53	185.00	184.80	185.28	186.42	185.70	184.70
16.....	185.12	184.58	184.60	184.78	184.80	185.98	185.10	185.00	185.20	186.02	185.35	184.90
17.....	184.88	184.50	184.60	184.78	184.85	185.78	185.10	184.90	185.25	185.58	185.28	185.00
18.....	184.85	184.50	184.75	184.77	184.95	185.78	185.10	184.80	185.95	185.88	185.60	184.88
19.....	184.88	184.45	184.85	184.70	185.45	185.48	185.08	184.80	186.42	185.62	185.78	184.62
20.....	184.85	184.40	184.80	184.70	185.52	184.85	184.88	184.70	185.92	185.55	185.62	184.60
21.....	184.70	184.40	184.88	185.45	185.25	185.12	184.92	184.70	185.90	185.30	185.40	184.60
22.....	184.60	184.40	184.95	185.38	185.18	185.08	184.98	184.70	186.08	185.25	185.32	184.60
23.....	184.70	184.40	184.88	185.15	185.08	185.12	185.00	184.70	185.80	185.25	185.40	184.60
24.....	184.70	184.45	184.92	184.92	185.10	186.15	185.12	184.70	185.58	185.10	185.60	184.60
25.....	184.70	184.45	184.80	184.98	184.95	186.92	185.28	184.70	185.50	185.10	185.45	184.60
26.....	184.62	184.38	185.15	185.05	185.02	187.15	185.30	184.80	185.38	185.15	185.60	184.60
27.....	184.55	184.42	185.85	185.48	185.02	186.10	185.25	184.82	185.38	185.15	185.38	184.60
28.....	184.55	184.42	185.42	185.15	184.95	185.72	185.20	184.82	185.40	184.93	185.28	184.65
29.....	184.60	184.48	185.10	185.05	184.80	185.45	185.02	......	186.20	185.20	185.08	184.60
30.....	184.55	184.40	184.88	184.92	185.05	185.22	185.10	......	185.77	185.20	184.98	184.60
31.....	184.50	184.45	......	186.48	......	185.08	185.10	......	185.60	......	184.88	......

MOHAWK RIVER AT VISCHER FERRY DAM

Location.— At Vischer Ferry dam of the Barge canal (lock No. 7), 1 mile above Stony Creek and Vischer Ferry, about 7 miles below Schenectady, Schenectady county, and about 11 miles above the mouth.

Drainage area.— 3,400 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.—June 24, 1913, to June 30, 1919.

Gage.— Stevens water-stage recorder (showing head on crest of spillway), in the southerly corner of the basin near upper end of Barge canal lock; installed August 18, 1916.

Staff gage in masonry of outer lock wall, just above upper gates, read March 30 to May 23, 1914, and March 30 to August 17, 1916. Datum of gage 12.1 feet lower than that of recorder.

Water-gage recorders inspected by engineers from the Albany office of the United States Geological Survey. Staff gage read by lock-tenders.

Channel and control.—The control is the crest of the spillway.

Extremes of discharge.— Current year: Maximum stage* not determined at this station. Minimum stage from water-stage recorder, 0.21 foot at 10 A. M., December 3; discharge, 380 second-feet.

1913–1919: Maximum stage recorded, 7.6 feet just before noon, March 28, 1914, determined by leveling from flood marks; discharge, not determined. Minimum stage from water-stage recorder, 0.18 foot from 4 A. M. to 5 A. M. and 4 P. M. to 6 P. M., October 31, 1914; discharge, about 290 second-feet.

Diversions.— Barge canal lock No. 7, at the south end of dam, was put in operation May 15, 1915. The following tables of discharge include the flow over the spillway and through the lock and water-wheels.

Regulation.— Flow affected by operation of dams upstream.

Accuracy.— Stage-discharge relation practically permanent. Probably not affected by ice. Rating curve well defined by discharge measurements between 350 and 2,500 second-feet; above 2,500 second-feet, based on theoretic coefficients. Gage in lock

* Waste-gates in dam open during spring floods. See record at Crescent dam for maximum flow.

read to tenths twice daily, January 29 to March 23; operation of water-stage recorder satisfactory for the remainder of year. Daily discharge ascertained from staff gage record by applying mean daily gage height to rating table; daily discharge for remainder of year determined by use of discharge integrator. Records fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Daily discharge, in second-feet, of MOHAWK RIVER AT VISCHER FERRY DAM, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	2,490	1,080	2,700	3,090	15,300	3,890	4,750	3,420	6,870	9,530	4,380	2,980
2	4,800	1,250	1,750	2,880	10,500	2,900	9,570	2,580	12,400	8,480	6,340	2,380
3	2,690	1,510	1,600	2,790	7,530	2,970	13,200	2,310	9,900	7,920	9,020	2,300
4	2,490	1,490	1,620	3,640	7,230	3,400	9,020	3,540	8,520	8,480	6,520	1,820
5	1,950	1,450	1,660	3,790	5,630	3,580	6,250	3,620	8,620	10,700	8,630	2,260
6	2,700	1,510	1,940	2,950	4,290	4,520	4,680	3,460	9,350	13,200	8,120	1,780
7	2,130	1,530	2,520	6,750	4,330	3,740	4,390	3,380	7,020	14,600	7,260	2,180
8	1,660	2,730	1,260	6,720	3,910	4,100	4,110	3,060	5,390	15,000	8,620	2,030
9	1,950	1,490	1,180	4,190	3,230	5,230	5,170	2,740	5,920	14,300	7,160	1,860
10	2,280	3,570	1,110	4,200	4,170	6,770	4,250	2,430	14,000	15,500	7,280	1,940
11	3,030	2,490	1,320	3,290	3,010	6,700	3,170	2,340	12,300	16,700	15,000	1,770
12	2,610	1,650	1,890	2,430	3,390	6,500	2,580	2,090	8,820	25,400	16,800	1,960
13	3,040	1,640	2,490	2,720	3,800	5,610	2,410	2,250	7,720	28,300	17,900	1,430
14	3,600	1,380	2,640	2,380	3,270	5,330	2,810	2,410	7,420	21,500	12,300	1,380
15	5,180	1,600	2,540	2,780	2,530	9,900	3,550	3,540	5,930	15,500	9,130	2,050
16	5,240	1,240	2,270	2,720	3,000	13,100	4,050	4,760	4,940	12,800	7,260	3,280
17	2,950	1,350	1,790	2,580	2,720	7,960	4,110	3,670	6,460	9,490	6,400	3,320
18	3,350	1,060	3,420	2,590	5,410	8,800	3,860	3,050	13,600	10,200	10,000	2,690
19	3,040	980	2,880	2,380	7,490	4,350	3,860	2,810	14,600	8,900	12,100	1,940
20	2,440	1,120	2,960	2,150	7,840	3,080	3,800	2,410	11,200	7,060	7,880	2,050
21	2,350	1,320	3,830	9,190	6,460	4,490	3,800	2,660	11,700	5,800	7,210	1,870
22	1,820	1,260	3,730	6,840	5,400	4,340	3,800	2,580	11,800	5,420	6,700	1,860
23	2,180	1,140	2,560	4,940	5,280	7,470	3,800	2,660	10,000	4,770	8,410	1,770
24	1,650	1,130	3,620	3,780	3,980	12,300	4,960	2,580	8,520	5,370	8,650	1,580
25	1,710	1,160	2,910	3,250	4,780	16,800	6,250	2,740	7,320	5,460	8,820	1,340
26	1,480	1,210	7,360	4,320	4,170	17,700	6,470	3,380	9,100	5,630	8,400	1,240
27	1,420	1,020	10,700	8,110	3,470	11,500	5,380	3,380	8,440	5,270	6,520	1,500
28	1,250	1,000	7,270	5,670	3,450	8,160	4,820	3,460	9,660	5,140	5,820	1,760
29	1,160	1,180	4,280	5,070	3,120	5,890	4,470	......	14,200	6,040	4,330	2,530
30	1,180	1,300	3,400	5,200	4,520	4,490	4,110	......	11,500	5,940	4,110	2,020
31	1,020	1,830	......	20,100	......	4,840	3,800	......	10,300	......	2,930	......
Mean	2,480	1,470	3,040	4,630	5,090	6,770	4,880	2,980	9,470	10,900	8,390	2,030

NOTE.— Discharge, August 12 to 19, August 26 to September 6, September 13 to 16 and 27 to 30, November 27 to 30, December 1 to 14 and 18 to 31, January 1 to 31, February 1 to 3, 12 to 14 and 17 to 20, March 26 to 31, April 1 to 17, and June 21 to 28, taken from record at Crescent dam, because of no record at Vischer Ferry.

Monthly discharge of MOHAWK RIVER AT VISCHER FERRY DAM, for the year ended June 30, 1919

[Drainage area, 3,400 square miles]

Month	Discharge in Second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	5,240	1,020	2,480	0.723	0.83
August	3,570	980	1,470	0.429	0.49
September	10,700	1,110	3,040	0.886	0.99
October	20,100	2,150	4,630	1.36	1.57
November	15,300	2,530	5,090	1.49	1.66
December	17,700	2,900	6,770	1.99	2.29
January	13,200	2,410	4,880	1.43	1.65
February	4,760	2,090	2,980	0.874	0.91
March	14,600	4,940	9,470	2.78	3.20
April	28,300	4,770	10,900	3.20	3.57
May	17,900	2,930	8,390	2.46	2.84
June	3,320	1,240	2,030	0.595	0.66
The year	28,300	980	5,178	1.52	20.66

MOHAWK RIVER AT DUNSBACH FERRY

Gage No. 135

This station, maintained March 12, 1898, to April 1, 1899, by the United States Deep Waterways Commission, was reëstablished August 1, 1900, by the United States Geological Survey in coöperation with this Department and is now maintained by this Department. It is located at the Watervliet pumping station on the right, or south, bank of the Mohawk river at the site of the old Dunsbach Ferry dam, about 3 miles above the old Erie canal aqueduct at the village of Crescent, about 5.6 miles below the new Vischer Ferry dam and about 4.6 miles above the new Crescent dam. Discharge computations were discontinued in 1911 and the old dam was partially removed in August, 1912.

The original gage was a staff in three sections, having a range of 17 feet, the lower two sections, from 2.0 to 9.0, being secured to crib work, and the upper sections, from 9.0 to 19.0, being secured to the wall of the pump-house. Reference points were used from October 22, 1914, to March 6, 1916, when a staff gage was erected. This was replaced on January 16, 1917, by a standard Type A gage, No. 135, secured to the northwest corner of the Watervliet Hydraulic Company's pump-house and having

a range of 12.0 feet, between elevations 183.0 and 195.0. A standard bench-mark plug is set near the gage at elevation 190.0 (B. C. datum).

The gage is read twice daily—at 8 A. M. and 4 P. M.—to tenths.

Emendation.— Owing to transposition of figures the elevation of the reference point on the door-sill has been used as 191.12 instead of 191.21. All elevations from October 15, 1912, to March 5, 1916, inclusive, should be 0.09 higher.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT DUNSBACH FERRY, for the year ended June 30, 1919. Robert Wilson, Observer

DAY	July	Aug.	DAY	July	Aug.	DAY	July	Aug.
1	185.7	184.4	11	184.85	......	21	184.75	......
2	185.5	......	12	184.8	......	22	184.7	......
3	185.5	......	13	184.8	......	23	184.6	......
4	185.6	......	14	184.8	......	24	184.6	......
5	185.55	......	15	184.8	......	25	184.55	......
6	185.5	......	16	184.9	......	26	184.5	......
7	185.4	......	17	184.95	......	27	184.5	......
8	185.2	......	18	184.95	......	28	184.5	......
9	185.05	......	19	184.85	......	29	184.5	......
10	184.9	......	20	184.8	......	30	184.5	......
						31	184.4	......

NOTE.— Station discontinued August 2, 1918.

MOHAWK RIVER ABOVE CRESCENT DAM, NEAR COHOES

Gage No. 134

This station, established October 22, 1916, is located above Crescent dam, in the guard-gate by-pass at the entrance to the land-line between Crescent dam and Waterford. The gage, No. 134, is a standard Type A gage, secured to the north side of the pier between the guard-gate and by-pass just above the Taintor gate, and has a range of 12 feet, between elevations 182.0 and 194.0.

The gage is read twice daily — at 6 A. M. and 6 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER ABOVE CRESCENT DAM, NEAR COHOES, for the year ended June 30, 1919. Ed. M. Powers, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1......	184.65	184.40	184.65	184.70	186.45	184.95	185.05	184.90	184.80	185.60	185.20	184.80
2......	185.05	184.40	184.50	184.80	185.80	184.75	185.60	184.80	186.00	185.50	185.20	184.70
3......	184.70	184.40	184.50	184.70	185.45	184.90	186.15	184.80	185.80	185.40	185.40	184.80
4......	184.75	184.50	184.45	184.90	185.25	184.90	185.70	184.80	185.60	185.00	185.30	184.70
5......	184.55	184.50	184.45	184.90	185.25	184.80	185.30	184.80	185.50	185.75	185.60	184.75
6......	184.70	184.50	184.50	184.80	185.10	184.95	185.05	184.80	185.50	185.95	185.55	184.70
7......	184.60	184.50	184.75	185.35	185.10	184.90	184.85	184.80	185.50	186.10	185.35	184.75
8......	184.50	184.50	184.45	185.15	185.00	185.05	184.80	184.80	185.20	186.15	185.55	184.70
9......	184.60	184.80	184.45	185.00	184.90	185.05	184.85	184.80	185.10	186.05	185.35	184.70
10......	184.60	184.80	184.40	185.00	184.90	185.30	184.75	184.80	186.00	186.20	185.30	184.65
11......	184.80	184.80	184.55	184.85	184.80	185.40	184.65	184.70	186.00	186.30	186.00	184.60
12......	184.75	184.55	184.50	184.70	184.80	185.30	184.50	184.70	186.00	187.00	186.40	184.60
13......	184.75	184.60	184.55	184.60	184.80	185.20	184.50	184.70	185.40	187.40	186.40	184.60
14......	184.85	184.50	184.70	184.65	184.85	185.20	184.50	184.75	185.40	186.80	185.90	184.60
15......	185.05	184.45	184.70	184.85	184.80	185.40	184.50	184.80	185.20	186.20	185.60	184.70
16......	185.15	184.50	184.55	184.75	184.80	186.05	184.50	185.00	185.15	185.95	185.50	184.85
17......	184.70	184.50	184.60	184.70	184.80	185.80	184.90	185.00	185.20	185.55	185.35	184.85
18......	184.75	184.50	184.80	184.70	185.05	185.65	184.95	185.00	186.00	185.85	185.65	184.85
19......	184.85	184.50	184.90	184.65	185.45	185.05	185.00	184.90	186.25	185.65	185.95	184.55
20......	184.75	184.40	184.80	184.60	185.45	184.85	185.00	184.85	185.85	185.40	185.70	184.60
21......	184.70	184.35	184.85	185.55	185.25	185.10	185.00	184.80	185.85	185.30	185.40	184.60
22......	184.50	184.50	184.90	185.35	185.15	185.00	184.95	184.80	185.90	185.20	185.30	184.60
23......	184.70	184.50	184.75	185.10	185.20	185.15	184.95	184.80	185.75	185.10	185.50	184.55
24......	184.60	184.50	184.90	184.95	185.00	186.00	185.00	184.80	185.50	185.20	185.70	184.50
25......	184.55	184.50	184.80	184.90	184.80	186.40	185.15	184.80	185.50	185.20	185.65	184.50
26......	184.55	184.50	185.20	184.95	185.00	186.60	185.30	184.80	185.50	185.25	185.60	184.50
27......	184.55	184.50	185.80	185.40	184.85	185.90	185.15	184.80	185.45	185.20	185.35	184.55
28......	184.50	184.50	185.10	185.15	184.75	185.65	185.10	184.60	185.50	185.10	185.20	184.50
29......	184.50	184.50	184.90	185.05	184.80	185.30	185.10	......	186.10	185.00	185.10	a
30......	184.50	184.50	184.95	184.90	185.05	185.10	185.05	......	185.85	185.15	184.90	a
31......	184.40	184.50	......	186.10	......	185.05	185.00	......	185.65	......	184.75	......

a No record.

MOHAWK RIVER BELOW CRESCENT DAM, NEAR COHOES

Gage No. 133

This station, established October 22, 1916, is located below Crescent dam, at the power-house. The gage, No. 133, is a standard Type A gage, secured to the southwest corner of the power-house, and has a range of 16 feet, between elevations 157.0 and 173.0.

The gage is read twice daily — at 6 A. M. and 6 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER BELOW CRESCENT DAM, NEAR COHOES, for the year ended June 30, 1919. Ed. M. Powers, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	156.15	155.7	157.5	157.4	159.1	157.7	157.95	157.6	157.5	158.4	158.0	157.6
2	157.75	155.65	157.4	157.45	158.65	157.25	158.35	157.5	158.8	158.2	158.0	157.4
3	157.45	157.25	155.7	157.5	158.45	157.55	158.9	157.6	158.6	158.1	158.2	157.45
4	157.6	157.35	155.7	157.7	158.15	157.45	158.45	157.5	158.3	158.15	158.1	157.35
5	157.15	155.85	155.65	157.7	158.1	157.55	158.2	157.5	158.3	158.5	158.4	157.45
6	157.5	155.5	157.2	157.65	157.85	157.7	157.8	157.5	158.3	158.75	158.3	157.4
7	157.45	157.25	157.5	158.15	157.8	157.7	157.7	157.5	158.3	158.9	158.15	157.4
8	156.15	157.4	157.4	158.0	157.6	157.9	157.6	157.5	157.9	158.9	158.25	157.5
9	157.35	157.2	155.85	157.6	157.65	157.6	157.75	157.6	157.7	158.8	158.1	157.5
10	157.3	157.6	155.75	157.65	158.25	157.95	157.5	157.6	158.6	158.95	158.0	157.3
11	157.6	157.55	156.3	157.5	157.6	157.95	157.55	157.5	158.8	159.0	158.8	157.1
12	157.5	156.3	155.7	157.4	157.65	157.95	157.3	157.5	158.8	159.75	159.2	157.25
13	157.55	156.6	156.65	157.4	157.35	157.8	157.3	157.5	158.2	160.15	159.15	157.1
14	157.65	156.55	157.6	157.4	157.45	157.95	157.3	157.5	158.0	159.55	158.65	157.1
15	157.9	156.95	157.5	157.55	156.65	158.2	157.3	157.5	158.0	158.9	158.35	157.5
16	157.8	155.85	155.8	157.5	157.45	158.8	157.3	157.7	157.9	158.65	158.3	157.55
17	157.5	157.35	155.55	157.3	157.7	158.55	157.7	157.6	157.9	158.35	158.1	157.6
18	157.5	157.3	156.05	157.35	157.75	158.45	157.7	157.6	158.75	158.6	158.45	157.6
19	157.55	155.85	157.5	157.45	158.25	157.75	157.8	157.6	159.0	158.4	158.65	157.3
20	157.55	155.8	157.4	157.45	158.15	157.3	157.8	157.55	158.6	158.2	158.25	157.3
21	157.5	155.75	157.55	158.2	158.1	157.8	157.8	157.5	158.6	158.05	158.1	157.3
22	156.0	157.3	157.6	158.15	157.85	157.85	157.75	157.5	158.75	157.9	158.0	157.4
23	157.3	157.3	157.6	157.75	157.9	157.8	157.75	157.5	158.6	157.7	158.2	156.45
24	157.3	157.3	157.5	157.55	157.8	158.8	157.8	157.5	158.2	157.8	158.5	156.65
25	156.2	157.4	156.6	157.45	157.6	159.25	157.9	157.5	158.2	157.85	158.45	156.45
26	156.1	157.4	157.75	157.7	157.75	159.4	158.0	157.5	158.2	158.05	158.35	156.55
27	157.3	157.35	158.65	158.3	157.5	158.6	157.8	157.5	158.2	158.0	158.05	156.9
28	157.3	157.3	158.15	157.85	157.55	158.4	157.75	157.5	158.2	157.85	157.9	157.2
29	156.15	157.35	157.7	157.75	157.7	158.15	157.65	......	158.7	157.7	157.8	a
30	155.85	157.3	157.45	157.45	157.95	157.8	157.65	......	158.65	157.95	157.65	a
31	155.55	157.3	......	158.7	......	158.25	157.75	......	158.35	......	157.5	......

a No record.

MOHAWK RIVER AT CRESCENT DAM

Location.—At the Crescent dam of the Barge canal, about 3 miles above the mouth of the river at Cohoes.

Drainage area.— 3,490 square miles. (Measured on U. S. Geological Survey topographic maps by State Engineer's Department.)

Records available.— December 1, 1917, to June 30, 1919.

Gage.— Gurley 7-day graph water-stage recorder on left bank, about 50 feet above guard-gate at head of Waterford series of locks. It is about 200 yards from left end of spillway. Inspected by operator from Barge canal power-house at the dam.

Determination of discharge.— The rating curve for the spillway has been computed from discharge determined from records at Vischer Ferry and gage heights observed at Crescent. Discharge through the locks and water wheels determined from records of operation of the locks.

Channel and control.— The control is the crest of the spillway.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 7.59 feet at 2 A. M., April 13; discharge 30,100 second-feet. Minimum stage from water-stage recorder, 4.04 feet at 6 A. M., August 21; discharge, zero.

1917–1919: Maximum stage recorded, 7.9 feet at 7 P. M., March 23, 1918; discharge, 38,100 second-feet. Minimum stage recorded, 4.04 feet, August 21, 1918; discharge, zero.

Diversions.— Water is diverted at this point for canal purposes through lock No. 6 and through the power-plant located at the east end of the dam. The following tables of discharge include the flow through lock No. 6 and through the power-plant.

Regulation.— Seasonal distribution of flow regulated by the Delta reservoir on the upper Mohawk and by Hinckley reservoir on West Canada Creek. Large irregular diurnal fluctuations during low water caused by operation of movable dams upstream.

Accuracy.— Stage-discharge relation permanent. Probably not affected by ice. Since rating is based on computation only, its accuracy is indeterminate. Record from water-stage recorder satisfactory. Results probably fairly good for periods of low water and fair for other periods.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Engineer and Surveyor. Recorder inspected by an employee of the State Superintendent of Public Works.

Daily discharge, in second-feet, of MOHAWK RIVER AT CRESCENT DAM, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	2,100	1,240	2,700	2,860	15,900	3,890	4,750	3,420	6,270	9,530	5,480	3,280
2.....	4,650	1,240	1,750	2,850	10,200	2,900	9,570	2,580	11,900	8,480	7,090	2,940
3.....	2,630	1,300	1,600	2,730	7,620	2,970	13,200	2,310	10,200	7,920	9,500	3,150
4.....	2,790	1,340	1,620	3,640	6,670	3,400	9,020	2,990	8,540	8,480	7,940	2,540
5.....	2,080	1,350	1,660	3,460	5,770	3,580	6,250	3,170	8,540	10,700	9,260	2,920
6.....	2,380	1,260	1,940	2,980	4,720	4,520	4,680	2,990	9,510	13,200	9,180	2,470
7.....	2,110	1,390	2,840	5,400	4,240	3,740	4,390	2,870	7,260	14,600	7,540	2,730
8.....	1,390	2,320	2,240	6.350	3,980	4,100	4,110	2,690	5,660	15,000	8,950	2,470
9.....	1,820	1,390	2,070	4,250	3,460	5,230	5,170	2,470	6,170	14,300	7,590	2,370
10.....	2,090	2,560	1,840	3,950	3,830	6,770	4,250	2,140	14,100	15,500	7,850	2,370
11.....	2,960	1,990	1,420	3,040	3,150	6,700	3,170	2,030	13,200	16,700	14,900	2,170
12.....	2,670	1,650	1,970	2,650	3,140	6,500	2,580	2,090	9,870	25,400	17,000	2,180
13.....	2,890	1,640	2,490	2,510	3,220	5,610	2,410	2,250	8,060	28,300	17,900	1,870
14.....	3,430	1,380	2,640	2,350	3,260	5,330	2,810	2,410	7,740	21.500	13,000	1,630
15.....	4,660	1,600	2,540	2,620	2,790	8,320	3,550	3,050	6,620	15,500	9,430	2,090
16.....	4,920	1,240	2,270	2,510	2,960	12,100	4,050	4,250	5,660	12,800	7,790	3,370
17.....	3,150	1,350	1,980	2,360	2,730	9,890	4,110	3,670	6,330	9,490	7,310	3,480
18.....	3,030	1,060	3,830	2,520	4,890	8,800	3,860	3,050	13.500	12,300	9,700	3,020
19.....	3,270	980	3,700	2,150	7,810	4,350	3,860	2,810	15,700	9,690	12,200	1,850
20.....	2,790	1,090	3,640	2,230	7,660	3,080	3,800	2,410	12,300	8,290	9,280	1,930
21.....	2,380	1,050	3,380	7,530	6,420	4,490	3,800	2,690	12,300	6,840	7,930	1,870
22.....	1,830	1,040	3,590	7,150	5,420	4,340	3,800	2,750	12,500	6,400	7,480	1,860
23.....	2,340	1,040	2,680	4,840	5,220	7,470	3,800	2,690	11,200	5,910	9,430	1,770
24.....	1,990	1,170	3,080	4,080	3,970	12,300	4,960	2,810	9,180	6,340	9,510	1,580
25.....	1,980	1,440	2,710	3,270	4,150	16,800	6,250	2,810	8,700	6.510	8,980	1,340
26.....	1,820	1,210	5,810	3,780	4,150	17,700	6,470	3,490	9,100	6,880	8,780	1,240
27.....	1,700	1,020	10,700	7,260	3,470	11,500	5,380	3,350	8,440	6,700	6,620	1,500
28.....	1,520	1,000	7,270	5,630	3,450	8,160	4,820	3,550	9,660	5,610	6,130	1,760
29.....	1,400	1,180	4,360	4,940	3,120	5,890	4,470	......	14,200	6,700	4,600	2,040
30.....	1,410	1,300	3,520	4,520	4,520	4,490	4,110	......	11,500	6,690	3,690	1,780
31.....	1,270	1,830	......	17,600	......	4,340	3,800	......	10,300	......	2,930	......
Mean...	2,500	1,380	3,130	4,320	5,060	6,750	4,880	2,850	9,810	11,400	8,870	2,250

NOTE.— Discharge for May 31 taken from Vischer Ferry record.

Monthly discharge of MOHAWK RIVER AT CRESCENT DAM, for the year ended June 30, 1919

[Drainage area, 3,490 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	4,920	1,270	2,500	0.716	0.83
August	2,560	980	1,380	0.395	0.46
September	10,700	1,420	3,130	0.897	1.00
October	17,600	2,150	4,320	1.24	1.43
November	15,900	2,730	5,060	1.45	1.62
December	17,700	2,900	6,750	1.93	2.22
January	13,200	2,410	4,880	1.40	1.61
February	4,250	2,030	2,850	0.817	0.85
March	15,700	5,660	9,810	2.81	3.24
April	28,300	5,610	11,400	3.27	3.65
May	17,900	2,930	8,870	2.54	2.93
June	3,480	1,240	2,250	0.645	0.72
The year	28,300	980	5,267	1.51	20.56

MOHAWK RIVER ABOVE DAM, COHOES

Gage No. 132

This station, established December, 1903, in coöperation with the United States Weather Bureau, but now maintained by this Department, is located above the power dam of the Cohoes Company across the Mohawk river at Cohoes. The pool above this dam extends three-quarters of a mile to the new Crescent dam. The dam has a fixed concrete crest 1,278 feet and 2 inches long at about elevation 157.0, on which flash-boards 3 feet high are maintained during low stages. There is also a 24-foot spillway in the gate-house. Owing to the irregular use of water for power purposes the surface above the dam fluctuates as much as 7 or 8 feet during twenty-four hours.

In October, 1916, a standard Type A gage, No. 132, in two sections, was erected on the breakwater to replace the old gage. The lower section has a range of 8 feet, between elevations 154.0 and 162.0, and the upper section has a range of 4 feet, between elevations 162.0 and 166.0. Standard bench-mark plugs are placed near the gages, for the lower section at elevation 161.0 (B. C. datum) and for the upper section at elevation 163.0 (B. C. datum).

The gage is read twice daily — morning and afternoon — to tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER ABOVE DAM AT COHOES, for the year ended June 30, 1919. Mrs. Rose Murphy and Antoine Plouffe, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	157.9	157.3	157.55	157.6	157.2	157.8	157.9	157.6	157.9	158.25	157.7	157.65
2	157.45	155.7	157.35	157.6	158.55	157.65	157.8	*a*	158.85	158.2	157.85	157.2
3	157.45	157.15	157.3	157.45	158.45	157.45	158.7	*a*	158.35	157.95	158.3	157.3
4	157.6	157.25	155.8	157.7	158.05	157.45	158.3	*a*	158.15	158.05	158.15	157.2
5	157.35	155.95	155.75	157.55	158.1	157.65	158.15	*a*	158.2	158.45	158.15	157.45
6	157.45	155.6	157.15	157.65	158.0	157.7	157.75	*a*	158.1	158.75	158.15	157.2
7	157.4	155.7	157.45	158.0	157.7	157.6	157.6	*a*	158.1	158.75	157.9	157.5
8	157.25	157.5	157.45	158.1	157.65	157.8	157.7	*a*	157.9	158.7	158.1	157.6
9	157.25	156.15	157.45	157.7	157.7	157.8	157.65	*a*	157.85	158.6	157.9	157.45
10	157.3	157.25	155.9	157.7	157.75	157.8	157.75	*a*	158.3	158.75	158.05	157.2
11	157.4	157.5	157.4	157.4	157.7	157.6	157.85	*a*	158.6	158.9	158.9	156.8
12	157.55	156.55	157.45	157.6	157.65	157.55	157.85	*a*	158.25	159.6	158.9	156.85
13	157.55	156.75	155.7	157.4	157.5	157.85	157.35	*a*	158.0	159.95	158.7	156.85
14	157.65	156.45	157.6	157.5	157.45	157.9	157.25	*a*	158.1	159.3	158.8	157.25
15	157.9	156.85	157.35	157.4	157.3	157.9	157.65	*a*	158.0	158.75	158.2	157.45
16	157.95	156.0	155.7	157.4	157.4	158.8	157.6	*a*	157.9	158.45	158.05	157.5
17	157.45	157.35	155.8	157.35	157.6	158.45	157.45	*a*	157.75	157.9	158.05	157.5
18	157.6	157.25	157.6	157.4	157.2	158.15	157.65	*a*	158.55	158.45	158.2	157.45
19	157.3	156.1	157.5	157.35	158.05	157.7	157.85	*a*	158.8	158.35	158.5	157.1
20	157.5	155.9	157.55	157.3	157.8	157.85	157.5	*a*	158.45	158.2	158.2	156.9
21	157.45	155.8	157.6	158.1	157.75	157.9	157.65	*a*	158.45	157.9	158.0	157.35
22	156.25	155.95	157.75	158.15	157.85	157.9	157.6	*a*	158.6	157.8	157.9	157.4
23	157.45	155.85	157.65	157.85	157.8	157.8	157.5	*a*	158.6	157.75	158.15	156.85
24	157.4	157.3	157.5	157.6	157.7	158.6	157.85	*a*	158.15	157.7	158.45	156.75
25	157.4	157.3	157.35	157.5	157.35	159.3	158.2	*a*	158.1	157.75	158.4	156.5
26	157.3	157.35	157.85	157.7	157.45	159.25	158.1	*a*	158.1	158.0	158.25	156.35
27	157.3	157.35	158.55	158.2	157.85	158.95	157.65	*a*	158.05	158.0	158.0	156.35
28	157.3	157.35	158.1	157.7	157.7	158.25	157.65	*a*	158.2	157.7	157.9	157.25
29	156.25	157.35	157.8	157.85	157.1	158.1	157.6	......	158.75	157.9	157.7	157.45
30	155.9	157.25	157.65	157.7	157.35	157.7	157.55	......	158.55	157.85	157.65	156.65
31	155.6	157.25	......	159.0	......	157.7	157.5	......	158.3	......	158.45	......

a No record.

MOHAWK RIVER AT WATERFORD

Gage No. 131

This station, established January 15, 1907, is located at Waterford on the most northerly branch of the Mohawk river and indicates its water-surface about 1,000 feet above its entrance to the Hudson river. As most of the flow of the Mohawk passes through the other branches, this gage also indicates closely the surface of the Hudson river at this locality, which is about 2⅓ miles above the new Federal dam at Troy.

Previous to July, 1913, the gage had been located at old lock in Waterford side-cut, at the wooden bridge across the Hudson at

Waterford, and on the coffer-dam below lock No. 2. On July 11, 1913, the gage was located on the north side of the timber crib approach wall to lock No. 2. On October 17, 1916, this was replaced by a standard Type A gage, No. 131, secured to the north side of the north lower concrete approach wall to lock No. 2 and having a range of 16 feet, in two sections. The lower section is between elevations 16.0 and 24.0 and the upper section between elevations 24.0 and 32.0. Standard bench-mark plugs are set, one near the lower section at elevation 23.0 (B. C. datum) and another near the upper section at elevation 28.0 (B. C. datum).

The gage is read twice daily — at 7 or 8 A. M. and 4 or 5 P. M. — to half-tenths.

Daily elevation of water-surface (B. C. datum) of MOHAWK RIVER AT WATERFORD, for the year ended June 30, 1919. Chas. Wolff and John Kircher, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	17.45	16.65	17.10	18.10	19.75	18.15	18.10	18.25	18.05	20.25	18.65	18.30
2.....	17.85	16.75	16.75	18.05	19.85	18.05	17.92	17.95	19.60	19.85	18.85	18.20
3.....	17.40	16.50	16.75	18.00	19.25	17.95	17.85	17.75	19.15	19.60	19.30	18.00
4.....	17.05	16.45	17.00	18.20	19.10	18.10	17.80	17.85	18.90	19.60	19.20	18.05
5.....	17.00	16.52	16.85	18.10	18.90	17.95	*a*	17.80	18.85	19.80	19.60	17.95
6.....	17.30	16.62	16.75	17.85	18.25	17.90	*a*	17.75	19.05	20.00	19.90	17.60
7.....	17.10	16.50	17.00	17.85	18.50	17.90	18.50	17.75	18.90	20.30	19.50	17.60
8.....	16.85	16.55	16.95	18.65	18.25	17.95	18.50	17.70	18.60	20.45	19.50	17.20
9.....	17.00	16.58	16.70	18.55	18.15	18.10	18.50	17.30	19.25	20.45	19.50	17.40
10.....	17.15	17.10	16.70	18.25	17.85	18.10	18.50	17.45	20.15	20.70	19.40	17.60
11.....	17.45	16.90	16.65	18.15	17.90	18.15	18.10	17.60	19.85	20.90	19.90	17.70
12.....	17.40	16.75	16.95	18.10	17.95	18.10	18.20	17.65	19.30	22.55	20.08	17.60
13.....	17.15	17.00	16.85	17.90	17.90	18.15	18.30	17.45	19.00	23.32	20.30	17.50
14.....	17.40	16.75	16.75	17.65	17.90	18.15	18.25	17.50	19.00	22.55	19.70	17.45
15.....	17.85	16.95	16.85	17.75	17.75	18.15	18.25	17.60	18.65	21.50	19.35	17.30
16.....	17.90	16.75	16.75	17.60	17.85	17.85	18.15	17.65	18.40	20.30	19.05	17.55
17.....	17.72	16.75	17.20	17.40	17.75	17.82	18.00	17.75	18.60	19.90	19.00	17.70
18.....	17.50	16.85	17.20	17.55	17.42	18.10	18.05	17.65	19.45	20.70	19.70	17.75
19.....	17.45	16.48	17.10	17.50	19.15	17.92	18.05	17.65	20.00	20.35	19.85	17.50
20.....	17.65	16.45	17.20	17.60	19.50	17.85	18.05	17.55	19.60	19.85	19.60	17.65
21.....	17.10	16.80	17.45	18.42	18.95	17.92	18.00	17.40	19.85	19.55	19.25	17.35
22.....	17.92	16.90	18.10	18.15	19.10	18.40	17.95	17.45	20.00	19.30	19.40	17.20
23.....	17.25	16.78	16.95	18.00	18.85	18.55	17.95	17.30	19.90	19.10	20.05	17.15
24.....	16.85	16.70	17.30	17.90	18.62	19.85	18.60	17.35	19.80	19.00	20.30	17.10
25.....	17.82	16.75	17.35	17.90	18.50	20.35	18.80	17.50	19.65	19.10	20.30	17.10
26.....	16.70	16.58	17.85	17.80	18.55	20.62	18.90	17.90	19.70	19.00	20.35	17.35
27.....	16.75	16.65	18.55	18.25	18.15	19.92	18.50	17.80	19.50	19.05	19.75	17.05
28.....	16.60	16.55	19.00	18.05	18.10	18.85	18.40	17.75	20.75	18.95	19.70	17.05
29.....	16.65	16.50	18.45	17.92	18.00	18.80	18.30	......	21.35	18.90	19.20	17.20
30.....	16.90	16.60	18.25	20.10	18.15	18.15	18.28	......	20.65	18.90	18.80	17.35
31.....	16.85	16.70	......	19.75	......	18.20	18.20	......	20.60	......	18.65	......

a No record.

NINE-MILE CREEK

DESCRIPTION

Nine-Mile creek drains a large portion of the territory on the north side of the Mohawk between Utica and Rome, emptying into the latter stream near Oriskany.

Water for the supply of the Rome summit level of the Barge canal will be diverted from West Canada creek above the Morgan dam at Trenton Falls through the Nine-Mile feeder to this stream, thence to the canal, which it enters three miles east of the main spillway for the Mohawk river and the east summit level guard-gate. Nine-Mile creek leaves the canal opposite its entrance over a concrete spillway with rounded crest 700 feet long at elevation 420.0, the canal pool. At the west end of the spillway there is a Taintor gate 24 feet long with sill at elevation 408.0.

NINE-MILE CREEK NEAR STITTVILLE

Gage No. 159

Location.— At a highway bridge over Nine-Mile creek, known as Powell's bridge, about 1¾ miles below the village of Stittville and about 3 miles from the village of Marcy.

Drainage area.— 59 square miles.

Records available.— Water-surface elevations, November 4, 1905, to June 30, 1919; discharge, January 1, 1907, to June 30, 1917. A gaging station was maintained at this point by the United States Deep Waterways Commission during its survey in 1898.

Gage.— A standard chain gage attached to the downstream side of the bridge is read twice daily — A. M. and P. M.— to tenths.

Discharge computations.— New rating curve used, beginning October 1, 1915. Due to the failure of the bridge abutment on June 3, 1916, the channel is partly obstructed and a new rating curve will be necessary. Sufficient measurements to establish this curve have not yet been made.

Control.— Rock. The channel is of uniform section and straight for several hundred feet above and below bridge.

Extremes of discharge.— Extremes for current year are not available.

1907–1917: Maximum recorded discharge, October 8, 1907, at 7 A. M., elevation 489.4; estimated discharge, 6,000 second-feet. Minimum recorded discharge, August 1, 17, 18 and 19, 1916, elevation, 483.7; discharge, 4 second-feet.

Winter flow.— Discharge relation seriously affected by ice.

Daily elevation of water-surface (B. C. datum) of NINE-MILE CREEK NEAR STITTVILLE, for the year ended June 30, 1919. Mrs. Geo. Powell, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	484.85	484.25	484.35	484.5	484.9	484.4	484.7	483.85	*b*	484.35	484.3	483.6
2	484.4	484.3	484.1	484.4	485.3	484.4	485.4	483.95	*b*	484.25	484.3	484.05
3	484.15	484.3	484.35	484.7	484.7	484.4	484.85	484.2	*b*	484.35	484.3	484.2
4	484.35	484.35	484.3	484.45	484.75	484.4	484.0	484.3	484.9	484.8	484.2	484.3
5	484.35	484.4	484.45	484.4	484.65	484.35	484.05	484.3	485.0	485.1	484.65	484.3
6	484.35	484.35	484.45	485.25	484.3	484.15	484.7	484.2	484.9	484.75	484.5	484.3
7	484.35	484.4	484.4	484.65	484.3	484.0	484.2	484.1	484.4	485.1	484.2	484.3
8	484.3	484.4	484.35	484.45	484.3	484.05	484.25	484.05	484.3	484.55	484.05	484.3
9	484.6	485.4	484.3	484.4	484.35	485.15	484.1	483.75	485.5	485.1	484.3	484.3
10	484.55	484.5	484.3	484.4	484.65	484.8	483.9	484.05	484.95	484.8	484.35	484.3
11	484.65	484.4	484.3	484.3	484.3	484.0	484.3	484.1	484.5	486.55	485.35	484.3
12	484.55	484.3	484.4	484.3	484.3	484.05	484.4	484.3	484.65	485.15	484.45	484.3
13	484.65	484.3	484.7	484.3	484.4	484.3	484.6	484.3	484.7	484.5	484.1	484.3
14	484.5	484.3	484.55	484.3	484.35	485.5	484.55	484.6	484.5	484.3	484.15	484.2
15	484.5	484.3	484.35	484.3	484.35	485.4	484.3	*b*	484.35	484.2	484.25	484.15
16	484.45	484.3	484.5	484.25	484.4	484.8	484.3	*b*	484.4	484.05	483.95	484.3
17	484.55	484.3	484.95	484.15	484.4	483.9	484.3	*b*	485.1	484.4	484.4	484.4
18	484.5	484.3	485.4	484.15	485.25	483.5	484.15	*b*	485.65	484.3	484.7	484.35
19	484.35	484.15	484.85	484.2	485.4	483.6	484.3	*b*	484.8	484.15	484.4	484.3
20	484.45	484.1	484.95	485.6	484.8	483.6	484.4	*b*	484.9	484.1	484.2	484.3
21	484.4	484.1	484.65	485.15	484.5	484.05	484.35	*b*	484.85	484.25	484.05	484.2
22	484.35	484.1	484.6	484.6	484.4	485.25	484.45	*b*	484.5	484.0	484.0	484.05
23	484.4	484.05	484.55	484.6	484.4	485.5	484.5	*b*	484.35	483.8	484.05	483.9
24	484.3	484.15	484.85	484.45	484.4	484.8	485.4	*b*	484.35	484.35	484.55	483.9
25	484.35	484.15	484.7	485.9	484.35	485.55	484.4	*b*	484.35	484.55	484.4	483.9
26	484.3	484.15	484.7	485.65	484.3	485.2	484.3	*b*	484.3	484.4	484.2	484.0
27	484.3	484.2	484.65	485.05	484.3	484.6	484.4	*b*	484.35	484.25	484.0	484.85
28	484.3	484.35	484.6	484.6	484.3	484.0	484.25	*b*	484.9	484.3	483.95	484.3
29	484.35	484.4	484.5	484.6	484.6	483.65	484.3	......	484.6	484.3	483.95	484.2
30	484.35	484.4	484.5	485.7	484.5	484.4	484.3	......	484.6	484.15	483.85	484.25
31	484.35	484.45	......	484.85	......	483.9	484.1	......	484.55	......	483.8	......

b Chain missing.

WEST CANADA CREEK

DESCRIPTION OF BASIN

West Canada creek rises in West Canada lake, in southwest-central Hamilton county, and flows southwestward, then southeastward into the Mohawk at Herkimer. The drainage area, approximately 584 square miles, is shown on the Utica, Little Falls, Remsen, Wilmurt, Old Forge and West Canada Lakes sheets, United States Geological Survey topographic maps.

There are about fifty small lakes and a few undrained ponds in the watershed of the stream. Most of these are situated near the headwaters, the largest single water-surface, exclusive of the Hinckley reservoir, being Honnedaga lake, 1.4 square miles in extent. There is also a small amount of controllable storage in reservoirs formed by three dams. Swamps and marshes are numerous in the region of the headwaters, usually adjoining lakes and tributaries and having an extent of one-half square mile or less each. At Trenton Falls there is an important plant of the Utica Gas & Electric Co.

Much of the region above the Hinckley reservoir is timber-covered. There are extensive sand areas in the central and upper drainage basins. The soil of the upper watershed is underlaid by granitic gneiss usually at or near the surface, excepting in alluvial valleys. From a point just above Twin Rock bridge (now submerged by the Hinckley reservoir) and extending downstream beyond Trenton Falls the underlying geological formation is Trenton limestone.

Compacted snow accumulates in the woodlands in winter, often to a depth of three or four feet, representing an inch of water for each five or six inches of snow. This melts slowly, feeding the stream in March and April, which months may show a run-off greatly exceeding the precipitation.

At Hinckley the State constructed and put in operation in January, 1915, a storage reservoir of 3,445,000,000 cubic feet capacity for the supply of the Rome summit level of the Barge canal. The stored water is passed down West Canada creek and a portion of it is diverted by a new dam on the site of the old Morgan dam at Trenton Falls, through a feeder canal and Nine-Mile creek to the Barge canal.

For table of drainage areas of West Canada creek, see page 296.

HINCKLEY RESERVOIR

Gage No. 163

This station is on West Canada creek at the dam of the Hinckley reservoir, a part of the water-supply system for the Barge canal. The dam, about 1,600 feet above the highway bridge at Hinckley, consists of earth dykes with concrete core and a concrete spillway with an ogee crest 400 feet long at elevation 1,225.0. At the north end of the spillway are four 60-inch discharge pipes with center of outlets at elevation 1,169.5. At the south end are two 42-inch pipes with center of inlets at elevation 1,164.25 for the use of the Consolidated Water Co., which diverts water at this point to Utica. The reservoir has a capacity of 3,445,000,000 cubic feet below, and a water-surface area of about 4.46 square miles at crest elevation. While small amounts of water were impounded during construction as early as April, 1914, the reservoir was first used for regulative purposes in January, 1915. A concrete staff gage on the south face of the north gate-house indicates reservoir surface just above spillway. It was read to tenths once daily — at 8 A. M.— from July 1 to April 20, and twice daily — at 8 A. M. and 4 P. M.— from April 20 to June 30.

Daily elevation of water-surface of HINCKLEY RESERVOIR AT HINCKLEY DAM, for the year ended June 30, 1919. W. H. Thomas, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	1,224.6	1,224.3	1,219.9	1,224.6	1,226.9	1,221.4	1,222.6	1,208.8	1,186.0	1,224.5	1,224.5	1,224.8
2	1,225.2	1,224.15	1,220.1	1,224.6	1,226.5	1,221.0	1,222.6	1,208.0	1,186.0	1,224.4	1,224.4	1,224.95
3	1,225.5	1,224.0	1,220.0	1,224.8	1,226.1	1,220.4	1,223.6	1,207.3	1,187.0	1,224.2	1,225.1	1,225.1
4	1,225.5	1,223.8	1,219.8	1,225.0	1,225.9	1,220.0	1,224.0	1,206.7	1,187.5	1,223.9	1,225.2	1,224.95
5	1,225.4	1,223.7	1,219.2	1,225.1	1,225.7	1,219.4	1,223.6	1,205.8	1,188.0	1,223.7	1,225.3	1,224.8
6	1,225.35	1,223.55	1,219.8	1,225.4	1,225.7	1,218.8	1,223.4	1,204.9	1,188.5	1,223.8	1,225.2	1,224.55
7	1,225.3	1,223.45	1,219.8	1,225.9	1,225.5	1,218.0	1,222.8	1,204.0	1,189.0	1,224.1	1,225.2	1,224.4
8	1,225.25	1,223.3	1,219.7	1,225.9	1,225.4	1,217.2	1,222.0	1,203.2	1,190.0	1,225.0	1,225.3	1,224.25
9	1,225.2	1,223.3	1,219.6	1,225.8	1,225.5	1,216.5	1,221.8	1,202.0	1,190.5	1,226.0	1,225.15	1,224.05
10	1,225.3	1,223.4	1,219.6	1,225.7	1,225.4	1,216.0	1,221.0	1,201.5	1,192.0	1,226.5	1,224.9	1,223.85
11	1,225.4	1,223.3	1,219.2	1,225.5	1,225.4	1,215.3	1,220.5	1,200.1	1,193.7	1,226.5	1,224.75	1,223.7
12	1,225.45	1,223.3	1,219.0	1,225.4	1,225.4	1,214.6	1,219.4	1,199.3	1,195.0	1,228.5	1,225.1	1,223.45
13	1,225.7	1,223.2	1,218.9	1,225.4	1,225.3	1,214.0	1,219.0	1,198.5	1,196.0	1,227.5	1,225.35	1,223.2
14	1,225.7	1,223.0	1,218.9	1,225.4	1,225.3	1,213.2	1,218.6	1,197.5	1,196.0	1,226.7	1,225.05	1,223.1
15	1,225.7	1,222.9	1,218.9	1,225.3	1,225.3	1,213.2	1,217.8	1,196.8	1,196.8	1,226.1	1,224.8	1,223.0
16	1,225.6	1,222.8	1,219.0	1,225.1	1,225.2	1,214.2	1,217.0	1,196.0	1,197.2	1,225.7	1,224.6	1,222.85
17	1,225.5	1,222.6	1,218.9	1,225.1	1,225.0	1,214.6	1,216.2	1,195.6	1,197.5	1,225.9	1,225.0	1,222.7
18	1,225.4	1,222.4	1,219.0	1,225.0	1,224.9	1,214.4	1,215.7	1,195.0	1,198.5	1,225.8	1,226.05	1,222.45
19	1,225.5	1,222.2	1,219.5	1,225.0	1,225.0	1,214.2	1,214.8	1,194.1	1,201.8	1,225.6	1,226.15	1,222.25
20	1,225.4	1,222.0	1,219.7	1,225.1	1,225.2	1,213.7	1,213.9	1,193.2	1,204.5	1,225.4	1,225.95	1,222.05
21	1,225.35	1,221.8	1,220.0	1,225.5	1,225.2	1,213.0	1,213.2	1,192.5	1,207.1	1,225.3	1,225.85	1,221.9
22	1,225.3	1,221.6	1,220.5	1,225.9	1,225.1	1,213.7	1,212.2	1,191.7	1,210.2	1,225.2	1,225.75	1,221.8
23	1,225.2	1,221.4	1,220.7	1,225.8	1,224.8	1,214.8	1,211.4	1,191.0	1,213.0	1,225.2	1,225.8	1,221.65
24	1,225.15	1,221.2	1,220.9	1,225.7	1,224.5	1,219.0	1,210.9	1,189.8	1,215.2	1,225.1	1,225.7	1,221.35
25	1,225.0	1,221.0	1,221.2	1,225.5	1,224.0	1,221.4	1,210.2	1,189.1	1,216.7	1,225.0	1,225.6	1,220.95
26	1,224.9	1,220.8	1,221.5	1,225.6	1,223.4	1,223.2	1,211.4	1,187.2	1,218.0	1,225.0	1,225.55	1,220.9
27	1,224.8	1,220.6	1,222.4	1,225.8	1,222.8	1,223.9	1,211.7	1,186.6	1,219.1	1,224.75	1,225.55	1,221.2
28	1,224.75	1,220.4	1,223.2	1,225.9	1,222.1	1,224.1	1,211.3	1,186.2	1,221.6	1,224.6	1,225.35	1,221.8
29	1,224.6	1,220.1	1,223.8	1,225.8	1,222.6	1,223.9	1,210.9	....	1,223.0	1,224.5	1,225.2	1,221.95
30	1,224.4	1,220.0	1,224.1	1,225.8	1,221.9	1,223.5	1,210.0	....	1,224.0	1,224.5	1,225.1	1,222.0
31	1,224.4	1,219.8	....	1,226.4	....	1,223.0	1,209.4	....	1,224.4	....	1,224.95	....

WEST CANADA CREEK AT HINCKLEY

Location.—About 1 mile below Hinckley dam and ¼ mile below bridge of N. Y. C. railroad, on west bank of creek.

Drainage area.—373 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.—June 14, 1919, to June 30, 1919.

Gage.—Gurley 7-day graph water-stage recorder on the right bank, about 1 mile below Hinckley dam, installed June 14, 1919. Recorder inspected by W. H. Thomas, gate-tender at State dam.

Channel and control.—Large boulders on solid rock bottom; practically permanent.

Extremes of discharge.—Maximum stage from water-stage recorder, 4.15 feet at 11 A. M., June 29; discharge, 660 second-feet. Minimum stage from water-stage recorder, 2.95 feet at 5 P. M., June 29; discharge, 85 second-feet.

Ice.—Stage-discharge relation not affected by ice.

Regulation.—Seasonal flow regulated by storage in Hinckley reservoir. Diurnal flow affected slightly at low stages by operation of the Fibre Company mill at Hinckley.

Diversions.—Consolidated Water Company of Utica diverts water-supply for Utica from Hinckley reservoir.

Accuracy.—Stage-discharge relation permanent. Rating curve well defined between 100 and 2,000 second-feet. Daily discharge ascertained by applying mean daily gage-height to rating table. Results good.

Coöperation.—Station installed by Utica Gas and Electric Company. Maintained by United States Geological Survey in coöperation with State Engineer and Surveyor and State Conservation Commission.

Discharge measurements of WEST CANADA CREEK AT HINCKLEY, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
June 4	J. W. Moulton	3.99	638
June 14	M. H. Carson	3.90	489
June 27	J. W. Moulton	3.81	417
June 29	J. W. Moulton	4.12	652
June 29	J. W. Moulton	3.48	278
June 29	J. W. Moulton	3.04	112

Daily gage height, in feet, of WEST CANADA CREEK AT HINCKLEY, for the year ended June 30, 1919

Day	June	Day	June	Day	June
1	......	11	......	21	3.77
2	......	12	......	22	3.76
3	......	13	......	23	3.77
4	......	14	3.87	24	3.77
5	......	15	3.87	25	3.77
6	......	16	3.88	26	3.78
7	......	17	3.88	27	3.81
8	......	18	3.88	28	3.81
9	......	19	3.87	29	......
10	......	20	......	30	3.81

Daily discharge, in second-feet, of WEST CANADA CREEK AT HINCKLEY, for the year ended June 30, 1919

Day	June	Day	June	Day	June
1	......	11	......	21	418
2	......	12	......	22	413
3	......	13	......	23	418
4	......	14	473	24	418
5	......	15	473	25	418
6	......	16	479	26	424
7	......	17	479	27	440
8	......	18	479	28	440
9	......	19	473	29	386
10	......	20	404	30	440

NINE-MILE CREEK FEEDER CANAL NEAR HOLLAND PATENT

Location.— At mouth of Nine-Mile feeder about 4 miles east of Holland Patent, Oneida county, ½ mile below highway bridge near farm of P. A. Wade, which is about 4 miles south and 1 mile west of village of Barneveld.

Records available.— June 5, 1919, to June 30, 1919.

Gage.— Gurley 7-day graph water-stage recorder on right bank. Recorder inspected by P. A. Wade.

Discharge Measurements.— Made from highway bridge half a mile upstream from gage.

Control.— Suppressed weir of concrete with a lip about 1.5 feet high and a spillway inclined about 1 to 2. Permanent.

Regulation.— Flow in the feeder is regulated by gates at the intake of the canal just below the power-plant at Trenton Falls.

Diversions.— None.

Ice.— Feeder canal not in operation during winter months.

Accuracy.— Daily discharge ascertained by applying mean daily gage heights to rating table, or for days of considerable fluctuation by discharge integration. Rating table well defined between 50 and 200 second-feet. Results good.

Coöperation.— United States Geological Survey in coöperation with State Engineer and Surveyor.

Discharge measurements of NINE-MILE CREEK FEEDER CANAL NEAR HOLLAND PATENT, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*
June 5	M. H. Carson	1.72	104
June 14	M. H. Carson	1.585	93.4
June 28	M. H. Carson	1.50	89.8

Daily gage height, in feet, of NINE-MILE CREEK FEEDER CANAL NEAR HOLLAND PATENT, for the year ended June 30, 1919

DAY	June	DAY	June	DAY	June
1		11	1.57	21	1.55
2		12	1.58	22	1.53
3		13	1.58	23	1.54
4		14	1.58	24	1.53
5		15	1.58	25	1.53
6	1.70	16	1.58	26	1.53
7	1.66	17	1.58	27	1.56
8	1.67	18	1.58	28	1.49
9	1.66	19	1.57	29	1.48
10	1.59	20	1.56	30	1.49

NOTE.— Record began June 6.

Daily discharge, in second-feet, of NINE-MILE CREEK FEEDER CANAL NEAR HOLLAND PATENT, for the year ended June 30, 1919

DAY	June	DAY	June	DAY	June
1		11	93	21	92
2		12	94	22	90
3		13	94	23	91
4		14	94	24	90
5		15	94	25	90
6	105	16	94	26	90
7	101	17	94	27	92
8	102	18	94	28	86
9	101	19	93	29	85
10	95	20	92	30	86

WEST CANADA CREEK AT POWER DAM, TRENTON FALLS

Gage No. 162

Location.—At the power dam and plant of the Utica Gas and Electric Company at Trenton Falls.

Drainage area.— 376 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.— November 1, 1905, to June 30, 1917.

Gage.— Vertical chain gage on upstream face of dam, read twice daily — at 8 A. M. and 5 P. M. Owing to irregular fluctuation, water-surface elevations are not published.

Discharge computations.— Discharge over the two spillways computed by weir formula, using coefficients derived from United States Geological Survey experiments and the assumption that the water-surface varies uniformly between the two daily readings as a basis for estimating duration and head of actual overflow. Flow through wheels estimated from average kilowatts developed per machine-hour during the twenty-four hours for which the total kilowatts developed. The number of machines operated and length of runs are furnished by the company. The relation is based on measurements made by the company over weirs in the tail-race.

Control.— Masonry crest of concrete dam 97.9 feet long at elevation 1,019.12* and by-pass cut through rock with crest 163.4 feet long, two feet below that of dam but provided with flash-boards to dam crest elevation for use during low-water periods, together with wheels in power-plant operating under a head of approximately 270 feet.

Extremes of discharge.— 1905–1918: Maximum recorded discharge, March 28, 1913, 25,700 second-feet. Minimum recorded discharge, on several days, 0 second-feet, when the pond was low and the wheels shut down.

Diversion.— The Consolidated Water Company of Utica diverts water at Hinckley for the supply of the city of Utica.

Regulation.— By new Barge canal storage reservoir at Hinckley, capacity 3,445,000,000 cubic feet, about 4 miles upstream.

* Incorrectly printed as 1,009.12 in Report of State Engineer and Surveyor for 1915, Vol. II. Page 319.

Small amounts of water were impounded during construction as early as April, 1914, but this reservoir was first used for regulative purposes in January, 1915. There are several small reservoirs farther up the stream.

Accuracy.— The kilowatts used in estimating the flow through the wheels is the total developed during 24 hours. The pondage is very limited and the surface fluctuates often as much as 10 feet during 24 hours in the low-water season. In connection with the calculated discharge at Trenton Falls it may be stated that there are a variety of conditions which tend to limit the accuracy obtainable.

Coöperation.—Maintained in coöperation with the United States Weather Bureau.

Daily elevation of water-surface (B. C. datum) of WEST CANADA CREEK AT POWER DAM, TRENTON FALLS, for the year ended June 30, 1919.

C. W. Young, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	1,018.02	1,019.15	a	1,020.31	1,021.69	1,020.31	1,020.31	1,020.23	1,019.81	1,019.94	1,019.90	1,019.65
2	1,018.56	1,019.10	a	1,020.31	1,020.10	1,020.31	1,020.36	1,020.40	1,019.98	1,019.94	1,019.90	1,017.90
3	1,018.64	1,019.10	1,019.40	1,020.31	1,020.73	1,020.23	1,020.31	1,020.23	1,019.81	1,020.06	1,019.90	1,015.56
4	1,018.56	1,019.27	1,019.40	1,020.31	1,020.36	1,020.23	1,020.31	1,020.19	1,019.81	1,020.06	1,020.31	1,016.02
5	1,018.14	1,018.94	1,019.31	1,020.31	1,020.23	1,020.23	1,020.31	1,020.15	1,019.85	1,020.06	1,020.06	1,019.19
6	1,017.94	1,017.52	1,019.27	1,019.77	1,020.10	1,020.23	1,020.31	1,020.15	1,019.56	1,020.48	1,020.02	1,015.73
7	1,018.06	1,017.52	1,019.27	1,020.36	1,019.94	1,020.23	1,020.31	1,020.15	1,019.65	1,020.10	1,020.02	1,018.94
8	1,017.44	1,017.15	1,019.48	1,020.36	1,019.86	1,020.40	1,020.31	1,020.15	1,019.52	1,020.15	1,019.94	1,019.56
9	1,017.86	1,018.81	1,019.31	1,020.19	1,019.69	1,020.31	1,020.31	1,020.23	1,019.65	1,021.06	1,019.90	1,014.69
10	1,018.10	1,017.86	1,019.19	1,019.98	1,019.90	1,020.31	1,020.31	1,020.06	1,016.60	1,021.36	1,019.90	1,012.40
11	1,018.44	1,010.48	1,019.27	1,019.77	1,019.81	1,020.23	1,020.23	1,019.98	1,017.60	1,021.48	1,020.31	1,016.19
12	1,018.70	1,019.19	1,019.31	1,019.60	1,019.77	1,020.23	1,020.31	1,019.98	1,017.77	1,023.73	1,019.98	1,016.56
13	1,019.02	1,019.02	1,019.40	1,019.73	1,019.73	1,020.19	1,020.27	1,019.98	1,016.36	1,021.73	1,019.94	1,018.98
14	1,019.31	1,018.81	1,019.31	1,019.56	1,019.65	1,020.19	1,020.27	1,019.98	1,016.60	1,021.52	1,019.90	1,018.98
15	1,018.77	1,018.77	a	1,019.56	1,019.56	1,020.31	1,020.27	1,019.98	1,016.60	1,020.86	1,019.90	1,019.48
16	1,018.52	1,018.69	1,019.40	1,019.52	1,019.56	1,020.19	1,020.27	1,020.02	1,019.69	1,020.60	1,018.98	1,017.31
17	1,018.31	1,018.48	1,019.40	1,019.52	1,019.90	1,020.06	1,020.27	1,019.98	1,014.94	1,020.60	1,019.90	1,017.81
18	1,018.44	1,019.40	1,019.31	1,019.48	1,019.90	1,019.98	1,020.27	1,019.94	1,014.98	1,020.56	1,020.19	1,016.19
19	1,018.40	1,019.02	1,019.40	1,019.48	1,020.19	1,020.02	1,020.40	1,019.90	1,014.44	1,020.44	1,020.77	1,018.19
20	1,018.15	1,018.77	1,019.48	1,019.56	1,020.31	1,020.10	1,020.27	1,019.90	1,015.98	1,020.31	1,020.48	1,017.65
21	1,018.31	1,018.44	1,019.48	1,019.94	1,020.31	1,020.06	1,020.27	1,019.90	1,017.65	1,020.06	1,020.02	1,016.73
22	1,017.52	1,018.48	1,019.48	1,020.36	1,020.31	1,020.23	1,020.27	1,019.90	1,019.36	1,020.02	1,020.15	1,019.44
23	1,017.65	1,018.48	1,019.31	1,020.27	1,020.31	1,020.27	1,020.27	1,019.98	1,019.65	1,020.02	1,020.02	1,013.77
24	1,017.36	1,017.90	1,019.36	1,020.06	1,020.40	1,020.36	1,020.27	1,019.90	1,013.56	1,019.94	1,020.06	1,013.36
25	1,016.56	1,019.40	1,019.40	1,019.90	1,020.31	1,020.40	1,020.27	1,019.90	1,017.77	1,019.90	1,020.23	1,012.77
26	1,016.02	1,019.06	1,019.44	1,019.90	1,020.31	1,020.40	1,020.31	1,019.81	1,014.48	1,019.86	1,019.81	1,012.73
27	1,017.36	1,017.69	1,019.48	1,020.56	1,020.27	1,020.40	1,020.23	1,019.81	1,018.06	1,020.31	1,019.77	1,015.69
28	1,018.69	1,017.27	1,019.48	1,019.94	1,020.31	1,020.40	1,020.23	1,019.77	1,019.73	1,019.86	1,019.60	1,016.77
29	1,019.19	1,017.27	1,019.56	1,020.19	1,020.31	1,020.40	1,020.23	....	1,019.90	1,019.86	1,019.52	1,019.23
30	1,019.19	1,017.19	1,019.40	1,020.23	1,020.31	1,020.36	1,020.23	....	1,019.77	1,019.86	1,020.23	1,011.77
31	1,019.19	1,016.36	....	1,021.36	....	1,020.36	1,020.23	....	1,019.73	....	1,018.48	....

a No water in creek above dam.

WEST CANADA CREEK AT MORGAN DAM, TRENTON FALLS

Gage No. 161

This station was established February 8, 1904, by this Department and is maintained in coöperation with the United States Weather Bureau. A staff gage is located on the right bank of the stream about 100 feet above the site of the old Morgan dam. A new dam has been constructed by the State 60 feet above the old dam to divert water through the Nine-Mile creek feeder for the supply of the Rome summit level of the Barge canal. The crest, at elevation 753.25, has an ogee type section and a length of about 147 feet. There is a Taintor gate with a clear span of 30 feet, sill at elevation 744.0 and top when closed at elevation 756.5. The gage is read twice daily — at 7 A. M. and 6 or 7 P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of WEST CANADA CREEK ABOVE MORGAN DAM, TRENTON FALLS, for the year ended June 30, 1919. C. W. Young, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	753.96	753.56	*a*	753.86	756.01	754.86	755.16	754.86	754.56	754.36	755.06	754.36
2.....	753.96	753.56	*a*	753.86	755.86	754.76	755.16	754.86	754.56	754.56	755.06	754.46
3.....	753.96	753.56	753.56	753.86	755.51	754.76	755.16	754.86	754.56	754.56	755.06	754.31
4.....	753.86	753.46	753.46	753.86	755.31	754.66	755.16	754.86	754.56	754.56	754.96	754.26
5.....	753.86	753.46	753.46	753.86	755.11	754.56	755.06	754.86	754.56	754.56	754.96	754.31
6.....	753.86	753.46	753.46	754.06	754.66	754.56	755.06	754.86	754.56	754.76	754.96	754.41
7.....	753.96	753.46	753.46	754.41	754.46	754.56	755.06	754.86	754.56	754.86	754.96	754.26
8.....	753.96	753.46	753.61	754.76	754.31	754.56	755.06	754.86	754.56	754.91	754.91	754.06
9.....	753.96	753.56	753.71	754.86	754.10	754.76	755.06	754.86	754.41	755.21	754.86	754.26
10.....	753.96	753.46	753.81	754.76	754.16	754.96	755.06	754.86	754.51	756.01	754.86	754.26
11.....	754.01	753.36	753.86	754.76	754.26	754.96	755.06	754.86	754.46	756.56	754.86	754.21
12.....	754.06	753.46	753.86	754.66	754.26	754.96	755.06	754.86	754.36	758.76	754.86	754.11
13.....	754.06	753.46	753.86	754.66	754.16	754.96	755.06	754.86	754.36	757.51	754.86	754.21
14.....	754.06	753.46	753.86	754.36	754.16	754.96	754.96	754.81	754.36	756.16	754.86	754.21
15.....	754.06	753.46	*a*	754.16	754.06	754.96	754.96	754.76	754.36	755.71	754.91	754.06
16.....	754.06	753.46	753.96	754.16	754.06	754.96	754.96	754.76	754.36	755.56	754.96	754.16
17.....	754.06	753.46	753.96	754.16	754.06	754.96	754.96	754.76	754.36	755.41	754.76	754.16
18.....	754.06	753.46	753.96	754.16	754.26	754.96	754.96	754.76	754.36	755.26	755.96	754.11
19.....	754.06	753.46	753.96	754.06	754.26	754.96	755.01	754.76	754.36	755.06	755.81	754.16
20.....	754.06	753.46	753.96	754.06	755.06	754.96	754.96	754.76	754.46	755.06	755.61	754.26
21.....	753.81	753.46	753.96	754.21	755.06	754.96	754.96	754.76	754.36	755.06	755.81	754.16
22.....	753.61	753.46	753.66	755.01	755.01	754.96	754.96	754.76	754.36	754.96	756.11	754.11
23.....	753.56	753.46	753.86	754.86	755.06	754.96	754.96	754.66	754.31	754.96	755.41	754.06
24.....	753.56	753.46	753.86	754.66	755.06	755.06	754.96	754.66	754.26	755.06	755.16	754.21
25.....	753.56	753.46	753.86	754.66	755.06	755.11	755.06	754.66	754.26	755.06	754.96	754.11
26.....	753.46	753.46	753.86	754.56	755.01	755.16	754.96	754.66	754.26	755.01	755.01	754.11
27.....	753.46	753.46	753.86	754.66	754.96	755.16	754.86	754.66	754.26	754.96	754.96	754.26
28.....	753.46	753.46	753.86	755.06	754.86	755.16	754.86	754.56	754.26	754.96	754.76	*a*
29.....	753.46	753.46	753.86	755.01	754.86	755.16	754.86	......	754.26	755.06	754.66	*a*
30.....	753.56	753.46	753.86	754.76	754.86	755.16	754.86	......	754.36	755.06	754.46	*a*
31.....	753.56	753.46	......	755.36	......	755.16	754.86	......	754.36	......	754.36	......

a No record.

WEST CANADA CREEK AT KAST BRIDGE

Gage No. 160

Location.— At the highway bridge over West Canada creek known as Kast bridge, opposite the station of that name on the Herkimer and Remsen branch of the N. Y. C. R. R., about 3½ miles above the village of Herkimer.

Drainage area.— 575 square miles.

Records available.— Water-surface elevations, May 15, 1904, to June 30, 1918; discharge, January 1, 1907, to June 30, 1918.

Gage.— The gage is of the weight-and-reel type and is secured to the upstream side of the bridge. It is read twice daily — at 8 A. M. and 4 P. M.— to hundredths.

Control.— Gravel and cobble rift about 1,500 feet below the gage. The bed of the stream is permanent with a fairly straight and uniform channel from the control to quite a distance above the gage.

Extremes of discharge.— 1907–1918: Maximum recorded discharge, March 26, 1913, at 8 A. M., elevation 451.06; estimated discharge, 23,300 second-feet. (See foot-note.) Minimum recorded discharge, September 12, 1913, at 8 A. M., elevation 441.64; discharge, 80 second-feet.

Winter flow.— Discharge relation affected by ice conditions. Discharge during January to March, inclusive, omitted.

Diversion.— The Consolidated Water Company of Utica diverts water at Hinckley for the supply of the city of Utica.

Regulation.— Seasonal by Barge canal storage reservoir at Hinckley, and daily by power-plant pondage at Trenton Falls.

NOTE.— A maximum elevation of 453.09 was recorded on February 11, 1917, at 4 P. M., due to backwater caused by stream filling with anchor ice and snow, but it is not believed that the discharge was a maximum.

Daily elevation of water-surface (B. C. datum) of West Canada Creek at Kast Bridge, near Herkimer, for the year ended June 30, 1919. Lloyd Kast, Observer

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	443.40	442.38	442.78	442.96	445.59	443.90	444.12	443.69	444.78	444.03	444.01	443.07
2.....	443.12	442.46	442.00	442.88	445.49	443.94	445.21	443.80	443.90	443.93	444.59	443.01
3.....	443.31	442.44	441.86	443.36	444.76	444.06	444.82	443.78	443.75	443.87	444.13	443.09
4.....	442.97	442.34	442.56	443.00	444.36	443.98	444.18	443.71	443.84	444.18	443.91	442.89
5.....	442.80	442.60	442.60	442.88	444.08	443.96	444.04	443.67	*b*	444.55	444.50	442.99
6.....	442.68	442.51	443.00	443.98	443.74	444.01	444.05	443.72	*b*	444.41	444.16	444.03
7.....	442.52	442.48	442.70	443.97	443.62	444.00	444.15	443.68	*b*	444.39	444.17	442.80
8.....	442.53	442.50	442.65	444.05	443.48	443.94	444.16	443.69	*b*	444.17	444.27	442.79
9.....	442.66	442.95	442.50	443.97	443.36	444.74	444.13	443.61	*b*	445.08	444.13	442.79
10.....	443.08	442.48	442.58	443.64	443.46	444.05	444.07	443.60	*b*	446.69	444.10	442.66
11.....	442.99	442.60	*a*	443.32	443.38	444.00	444.00	443.49	*b*	445.99	444.68	442.74
12.....	443.04	442.36	442.62	443.20	443.32	443.94	443.88	443.66	443.64	448.05	444.33	442.63
13.....	443.24	442.44	443.06	443.04	443.30	443.94	443.94	443.58	443.60	447.15	444.44	442.61
14.....	443.72	442.50	443.05	443.10	443.26	444.46	444.08	443.57	443.41	446.10	444.09	442.57
15.....	443.44	442.49	442.86	443.02	443.12	445.20	443.98	443.74	443.12	445.28	443.93	442.71
16.....	443.16	442.46	442.40	442.95	443.05	444.21	444.01	443.62	443.15	444.80	443.89	442.71
17.....	443.04	442.38	443.15	442.96	443.41	444.06	443.92	443.40	443.94	444.91	444.03	442.69
18.....	443.16	442.32	443.12	442.77	444.18	444.02	443.90	443.42	445.06	444.79	444.63	442.63
19.....	443.02	442.42	443.32	442.74	444.73	443.94	443.92	443.42	443.86	444.51	445.02	442.61
20.....	442.76	442.42	443.23	442.98	444.24	443.92	443.95	443.42	443.96	444.37	444.65	442.71
21.....	442.56	442.40	443.30	444.27	444.23	443.86	443.88	443.41	444.09	444.35	444.47	442.43
22.....	442.42	442.46	442.88	444.06	444.05	444.52	443.88	443.45	443.74	444.19	444.25	442.49
23.....	442.66	442.45	442.82	443.90	444.04	445.10	443.94	443.36	443.38	444.19	444.36	442.53
24.....	442.48	442.42	443.24	443.68	443.96	444.45	444.64	443.44	443.36	444.09	444.35	442.51
25.....	442.44	442.42	443.10	443.46	443.96	445.60	444.18	443.30	443.24	443.95	444.16	442.36
26.....	442.39	442.36	443.89	444.46	444.00	444.61	443.92	443.35	443.26	444.93	444.14	442.43
27.....	442.40	442.38	443.43	444.31	443.78	444.32	443.92	443.28	443.28	444.07	444.16	443.01
28.....	442.35	442.50	443.22	444.22	443.85	444.07	443.83	443.26	*c*	444.05	443.75	442.73
29.....	442.40	442.48	442.98	444.11	444.28	444.18	443.84	......	*c*	444.01	443.55	442.57
30.....	442.56	442.48	443.00	444.77	444.04	444.08	443.85	......	443.76	443.97	443.32	442.45
31.....	442.48	442.52	......	445.86	......	444.06	443.78	......	444.04	......	443.23	......

a No record. *b* Tape broken. *c* No record; high winds.

EAST CANADA CREEK

DESCRIPTION

East Canada creek rises in Hamilton county and flows southward between Herkimer and Fulton counties, joining the Mohawk at East Creek. In a general way its drainage basin is similar to that of West Canada creek, although its flow is less sustained and regular.

Spruce creek, the principal tributary of East Canada creek, enters 1 mile above Dolgeville and drains an area of 50 square miles. Water is diverted from this creek and from Beaver creek, one of the tributaries at Diamond Hill, and is carried to Little Falls through a cast-iron conduit 9 miles long.

For table of drainage areas of East Canada creek, see page 298.

EAST CANADA CREEK AT DOLGEVILLE

A gaging station on this stream was established for the U. S. Board of Engineers on Deep Waterways in 1898. It was maintained by the U. S. Geological Survey in coöperation with this Department from 1900 to June, 1907, inclusive, when it was taken over by this Department.

Location.— At the power-plant of the Herkimer County Light and Power Company at High falls about 1 mile below the village of Dolgeville and about 7 miles above the mouth of the stream.

Drainage area.— 257 square miles.

Records available.— September 23, 1898, to June 30, 1919.

Gage.— Above dam, a reference point on the right abutment; lower gage, a staff secured to the side wall of the tail-race below the power-plant. Readings twice daily — at 7 A. M. and 6 P. M.

Discharge computations.— Discharge over dam computed from curve based on United States Geological Survey experiments at Cornell University, with a full-sized model of the crest. Estimated flow through the turbines based on ratings by current-meter measurements made in the tail-race of the power-plant.

Control.— A masonry dam about 19 feet high with fixed flat crest 6 feet wide sloping downward upstream about 1 foot in 6, 190.25 feet long, upon which flash-boards are maintained during ordinary stages of the stream, together with turbines in power-plant.

Extremes of discharge.— 1898–1918: Maximum discharge recorded, March 26, 1913, at 9 P. M., approximately 14,500 second-feet. Minimum discharge recorded, August 21, 1910, 0 second-feet. No water was used for 19 hours while the pond was filling.

Winter flow.— Very slightly affected by ice, as the crest is kept clean during the winter months.

Diversion.— From Spruce and Beaver creeks at Diamond Hill for water-supply of Little Falls; from Cold brook for water-supply of Dolgeville. The run-off given in the table of monthly discharge is that passing the station and is exclusive of the above diversions.

Regulation.— By storage on Canada lake and several smaller lakes tributary to Canada lake. The flow from the smaller lakes is used to maintain a nearly constant elevation of Canada lake which in turn is used to regulate the flow in East Canada creek.

Tables of discharge not yet available for publication.

SCHOHARIE CREEK

DESCRIPTION OF BASIN

The source of Schoharie creek is about two miles east of Tannersville, at an elevation of 1,940 feet. The source is within about four miles of the easterly escarpment of the Catskill plateau. The stream valley is broad and the slope moderate throughout the upper regions. A small area, which apparently was formerly tributary to Schoharie creek, has been cut off by erosion and has thus become tributary to Kaaterskill. Nearly the entire drainage basin is irregular and precipitous. It is extensively covered with second-growth forests.

The basin of Schoharie creek is largely overlaid by slaty rocks, into which water percolates only to a slight depth. The valley soil is largely thin plastic clay, formed by disintegration of the native rocks. Passing from the headwaters toward the mouth, Schoharie creek crosses successively the Devonian sedimentary rocks, chiefly of the Catskill, Oneonta, Ithaca and Hamilton formations. All of these may be considered fairly impervious and free from fissures. It then crosses belts of Silurian formations, including Helderberg, Salina, Niagara and Medina sandstone and limestone. These rocks are underlaid by impervious Hudson river shales, but are themselves permeable, yielding numerous springs at the lower partings.

It is the intention of the Board of Water Supply of the city of New York to build a dam on the Schoharie creek at Gilboa for an additional water-supply. A tunnel about 18 miles long, beginning at a point on the creek near the county line north of Prattsville, will carry the water to the Esopus creek in the vicinity of Allaben, whence it will follow the natural course of the Esopus creek until it empties into the Ashokan reservoir. The area diverted will be approximately 314 square miles.

The entire drainage basin of 930* square miles is shown on the topographic maps of the United States Geological Survey. For area at different points along the stream, see table on page 299.

* The 930 square miles used above is the result of a joint determination of drainage areas, based on independent computations by the engineers of the Board of Water Supply of the city of New York and of the Department of State Engineer, and replaces the figure 900 previously used in the reports of the State Engineer.

SCHOHARIE CREEK AT PRATTSVILLE

Location.— On upstream side of highway bridge at Prattsville. Automatic gage is located on downstream side, left bank. Pipe gage on right bank below bridge has been discontinued.

Drainage area.— 236 square miles, planimetered on U. S. G. S. topographic maps. 1907–1912, inclusive, area considered 240 square miles, based on published records.

Records available.— January 1, 1903, to June 30, 1919.

Gage.— Standard Board of Water Supply chain gage, and Friez automatic water-stage recorder. Gage is read twice daily.

Discharge measurements.— From highway bridge; at low stages by wading 600 feet downstream from bridge.

Control.— Gravel bed, some small boulders. Affected by extreme freshets. Clear span, 187.5 feet. During low stages, dead water from Sta. 60 upward. Channel above bridge straight for about 300 feet. Channel below bridge straight for about 600 feet, with tendency to bifurcate at this point, where wading measurements are made. Both banks high, clean, and not liable to overflow except in extreme freshets.

Extremes of discharge.— Current year: Maximum stage recorded, 9.61 feet on March 28 at 4 A. M.; discharge, 6,850 second-feet. Minimum stage recorded, 4.47 feet on August 27 and 28; discharge, 13 second-feet.

1907–1919: Maximum stage recorded, 13.10 feet on March 27, 1913, at 4:45 P. M.; discharge, 16,500 second-feet. Minimum stage recorded, 4.13 feet on August 3, 1913; discharge, 5 second-feet.

Winter flow.— Discharge relation seriously affected by ice conditions. Flow determined by meter measurements and climatological data.

Accuracy.— Discharge rating curve fairly well defined. Beginning October 1, 1915, discharge is computed from record of automatic water-stage recorder.

Coöperation.— Maintained by Board of Water Supply of the city of New York.

Climatological observations are made at this station.

Daily discharge, in second-feet, of SCHOHARIE CREEK AT PRATTSVILLE, for the year ended June 30, 1919. J. A. Morris, H. M. Wood and I. Harrison, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	86	30	215	m 211	275	i 149	403	i 223	m1,762	698	299	248
2	95	23	110	172	215	i 124	864	i 207	698	583	392	223
3	76	20	65	169	189	i 105	660	i 203	438	597	343	196
4	99	18	41	162	175	i 112	530	im 200	365	909	299	175
5	m 81	18	43	142	172	i 98	409	i 193	426	1,210	403	158
6	78	m 18	43	438	165	i 74	i 375	i 189	511	1,520	370	136
7	81	18	43	449	152	im 59	i 348	i 186	354	1,710	333	142
8	74	m 18	35	318	145	i 88	i 328	i 182	338	1,896	333	124
9	67	18	31	257	133	i 78	i 313	i 179	1,010	1,632	333	122
10	59	20	33	211	136	i 74	i 299	i 172	1,980	1,372	1,060	119
11	55	24	33	182	124	i 65	i 289	i 169	855	1,394	2,008	112
12	55	21	31	182	124	i 86	i 280	i 165	632	3,252	1,854	105
13	72	21	30	196	122	i 122	i 275	i 162	557	1,736	2,165	105
14	86	m 21	39	189	119	231	i 270	182	426	1,251	1,416	100
15	86	m 21	39	179	112	714	i 266	235	359	936	m 1060	215
16	88	m 21	39	162	110	557	i 261	219	365	990	873	443
17	86	18	43	155	114	426	i 257	im 142	m 570	2,064	1,240	248
18	102	18	35	145	145	348	i 252	i 133	1,060	1,262	1,645	169
19	78	18	53	127	467	304	i 244	127	819	936	sm1000	127
20	65	m 18	78	117	359	294	i 240	127	698	746	770	175
21	61	18	203	139	280	240	im 235	114	668	646	706	142
22	m 53	16	219	139	235	252	i 235	114	611	543	1,200	105
23	m 47	15	142	130	227	855	i 474	119	530	467	1,619	98
24	45	15	119	122	211	683	1,060	136	474	486	1,240	105
25	47	15	100	117	193	1,606	505	165	409	505	1,000	m 95
26	37	13	576	110	i 186	963	461	299	375	426	794	90
27	35	m 13	1,339	117	i 165	675	370	235	397	392	632	252
28	31	13	524	107	i 155	557	338	186	3,073	359	517	420
29	m 28	15	323	m 105	175	i 486	299	......	1,170	365	426	219
30	26	15	235	105	175	420	270	......	1,070	328	359	m 165
31	37	m 15	......	252	......	381	244	......	855	......	294	......
Mean	65	18	162	181	185	362	376	177	770	1,040	870	171

m Meter measurement. *i* Ice conditions.
NOTE.— Flow based on meter measurements and climatological data.

Monthly discharge, in second-feet, of SCHOHARIE CREEK AT PRATTSVILLE, for the year ended June 30, 1919

[Drainage area, 236 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	102	26	65	0.28	0.323
August	30	13	18	0.08	0.092
September	1,339	30	162	0.69	0.770
October	449	105	181	0.77	0.888
November	467	110	185	0.78	0.870
December	1,606	59	362	1.53	1.764
January	1,060	235	376	1.59	1.833
February	299	114	177	0.75	0.781
March	3,073	338	770	3.26	3.758
April	3,252	328	1,040	4.41	4.920
May	2,165	294	870	3.69	4.254
June	420	90	171	0.72	0.808
The year	3,252	13	365	1.55	21.056

SCHOHARIE CREEK AT MIDDLEBURG

Gage No. 158

Location.— At highway bridge over Schoharie creek at Middleburg.

Drainage area.— 532 square miles. (From U. S. Geological Survey topographic maps.)

Records available.—August 24, 1906, to June 30, 1919.

Gage.— The old staff gage of two sections, the lower section attached to the end of a timber crib about 400 feet below the bridge and the upper secured to rubble retaining wall about 160 feet below the bridge, was replaced on February 5, 1919, by a standard staff gage established on a retaining wall on the east shore and about 30 feet above the highway bridge. The limits are from zero to 12 feet. The gage bench-mark, located on the northeast corner of the east abutment of the bridge, is at elevation 18.64 feet above the zero of the gage. Read twice daily— at 9 A. M. and 5 P. M.— to half-tenths.

Discharge measurements.— From bridge and by wading.

Control.— Riffle about 1,600 feet below bridge. The bed of the stream is of gravel and cobblestones and fairly smooth and permanent. The stream overflows the banks during floods.

Extremes of discharge.— 1906–1917: Maximum recorded discharge, February 20, 1909, at 9 A. M., approximately 31,600 second-feet. Minimum discharge recorded, September 14 to 21, inclusive, 1913, 12 second-feet.

Winter flow.— Very slight effect from ice, open-water rating curve used.

Accuracy.— New rating curve used, beginning October 1, 1915; well defined to a gage height of 6 feet.

Daily gage height, in feet, of SCHOHARIE CREEK AT MIDDLEBURG, for the year ended June 30, 1919. George L. Danforth and Carlton Cornwell, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	1.20	0.75	1.08	1.80	2.05	1.45	*a*	*a*	5.00	3.20	2.50	2.05
2.....	1.20	0.75	1.62	1.70	1.80	1.50	*a*	*a*	3.45	2.90	2.60	1.95
3.....	1.20	0.70	1.22	1.60	1.60	1.50	*a*	*a*	2.90	2.90	2.55	1.85
4.....	1.20	0.65	1.02	1.60	1.60	1.55	*a*	*a*	2.75	3.70	2.50	1.75
5.....	1.25	0.70	0.92	1.50	1.55	1.50	*a*	2.00	3.15	4.10	3.20	1.70
6.....	1.20	0.75	0.85	2.20	1.50	1.45	*a*	1.80	3.20	4.20	3.10	1.65
7.....	1.15	0.75	0.85	2.50	1.50	1.52	*a*	1.80	2.65	4.90	3.00	1.60
8.....	1.10	0.70	0.85	2.00	1.50	1.58	*a*	1.70	2.60	4.95	2.80	1.60
9.....	1.05	0.65	0.85	1.92	1.45	1.75	*a*	1.60	3.10	4.75	2.80	1.50
10.....	1.08	0.62	0.78	1.72	1.45	1.62	*a*	1.70	4.95	4.35	3.90	1.50
11.....	1.10	0.70	0.70	1.68	1.40	1.52	*a*	1.80	3.85	4.50	5.20	1.45
12.....	1.05	0.75	0.70	1.65	1.38	1.50	*a*	1.65	3.50	6.30	4.95	1.40
13.....	1.05	0.75	0.70	1.75	1.35	1.58	*a*	1.60	3.05	4.85	5.35	1.30
14.....	1.12	0.75	0.70	1.72	1.35	1.85	*a*	1.65	2.85	4.30	4.55	1.25
15.....	1.35	0.75	0.70	1.68	1.35	2.58	*a*	2.30	2.65	4.00	4.30	2.85
16.....	1.30	0.70	0.72	1.58	1.30	2.58	*a*	2.05	2.65	3.85	3.85	3.05
17.....	1.35	0.70	0.80	1.50	1.30	2.38	*a*	1.85	3.50	4.85	3.70	2.40
18.....	1.38	0.65	0.75	1.48	1.45	2.08	*a*	1.75	3.95	4.10	3.70	2.10
19.....	1.22	0.60	0.75	1.40	2.10	2.00	*a*	2.00	3.80	3.75	3.65	1.75
20.....	1.15	0.60	0.82	1.45	2.10	1.92	*a*	1.95	3.65	3.55	3.55	2.00
21.....	1.08	0.58	1.32	1.50	1.92	1.85	*a*	1.75	3.60	3.35	3.25	2.15
22.....	1.00	0.58	1.78	1.45	1.78	1.95	*a*	1.60	3.35	3.15	2.90	1.75
23.....	0.95	0.53	1.45	1.45	1.70	2.45	*a*	1.50	3.10	2.95	3.35	1.55
24.....	0.90	0.48	1.30	1.40	1.65	2.90	*a*	1.55	2.95	2.80	3.90	1.50
25.....	0.90	0.78	1.25	1.35	1.60	4.25	*a*	1.50	2.85	3.00	3.50	1.40
26.....	0.90	0.80	1.72	1.40	1.48	3.35	*a*	1.90	2.75	2.90	3.20	1.40
27.....	0.82	0.72	4.02	1.35	1.32	2.90	*a*	2.10	2.65	2.80	2.95	1.50
28.....	0.75	0.70	2.68	1.30	1.40	2.48	*a*	2.00	4.55	2.80	2.85	2.65
29.....	0.70	0.65	2.15	1.30	1.45	2.40	*a*	......	4.50	2.75	2.60	2.05
30.....	0.70	0.65	1.85	1.40	1.40	2.40	*a*	......	3.75	2.60	2.40	1.60
31.....	0.70	0.65	......	1.70	......	2.40	*a*	......	3.40	......	2.30	......

a No record.

SCHOHARIE CREEK AT CENTRAL BRIDGE

Gage No. 157

This station, established April 3, 1904, and maintained by this Department in coöperation with the United States Weather Bureau, is located on the D. & H. R. R. bridge across Schoharie creek near Schoharie Junction. Discharge is not computed at this station. The water-surface elevations are referred to United States Geological Survey datum. A standard chain gage attached to the downstream truss is read twice daily — A. M. and P. M.— to half-tenths.

Daily elevation of water-surface (U. S. G. S. datum) of SCHOHARIE CREEK AT CENTRAL BRIDGE, for the year ended June 30, 1919. A. M. Spencer, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	567.18	566.72	566.68	567.95	567.90	567.52	568.00	568.50	571.05	569.12	568.50
2	567.18	566.72	567.42	567.78	568.00	567.50	570.60	568.50	570.00	569.82	568.50
3	567.18	566.72	567.32	567.70	567.90	567.50	570.15	568.48	569.15	570.30	568.50
4	567.15	566.72	567.28	567.78	567.82	567.50	569.28	568.38	568.78	571.80	568.50
5	567.12	566.75	567.18	567.72	567.78	567.50	568.92	568.25	568.70	570.25	569.30
6	567.15	566.78	567.10	568.22	567.75	567.52	569.75	568.05	568.70	570.95	568.85
7	567.12	566.80	567.02	568.70	567.72	567.70	570.50	567.85	568.95	571.35	568.32
8	567.12	566.80	566.92	568.10	567.68	567.80	570.48	567.80	568.85	571.35	567.90
9	567.15	566.80	566.85	567.92	567.62	567.90	570.25	567 80	569.38	571.22	567.85
10	567.45	566.65	566.82	567.88	567.58	567.95	570.25	567.75	571.35	571.10	569.75
11	567.52	566.62	566.82	567.80	567.45	568.00	570.25	567.72	569.78	570.72	570.75
12	567.42	566.62	566.82	567.72	567.32	567.85	570.25	567.70	569.10	572.28	572.12
13	567.42	566.62	566.80	567.72	567.22	567.65	570.60	567.65	568.82	571.70	572.80
14	567.42	566.60	566.80	567.72	567.30	567.70	570.65	567.65	568.68	571.15	571.90
15	567.40	566.68	566.78	567.70	567.30	568.90	570.60	568.45	568.58	570.70	571.20
16	567.38	566.62	566.78	567.65	567.30	568.90	570.30	568.28	568.50	570.15	570.50
17	567.32	566.62	566.75	567.65	567.30	568.62	570.10	567.95	569.10	571.10	569.95
18	567.30	566.65	566.72	567.60	567.35	568.28	570.35	567.78	570.50	570.55	571.50
19	567.25	566.62	566.80	567.55	568.10	568.12	569.75	567.70	569.60	570.00	569.88
20	567.20	566.62	566.80	567.55	568.25	568.10	569.55	567.70	568.88	569.00	569.70
21	567.18	566.58	566.95	567.52	568.00	568.05	569.50	567.70	569.00	568.82	569.22
22	567.15	566.58	567.48	567.50	567.88	568.08	569.55	567.62	569.02	568.28	569.42
23	567.10	566.58	567.72	567.48	567.82	568.70	569.60	567.60	569.05	567.75	570.20
24	567.10	566.58	567.58	567.45	567.72	568.70	570.45	567.60	569.05	568.20	569.88
25	567.08	566.75	567.52	567.40	567.62	571.25	570.25	567.60	568.98	568.70	*a*
26	566.98	566.85	567.65	567.40	567.52	570.08	569.70	568.30	569.35	568.68	*a*
27	566.85	566.82	569.95	567.48	567.50	569.60	569.15	568.75	568.72	568.62	*a*
28	566.80	566.80	569.05	567.42	567.50	569.20	568.70	568.25	570.15	568.60	*a*
29	566.80	566.72	568.40	567.38	567.48	568.70	568.65	......	569.92	568.60	*a*
30	566.75	566.65	568.05	567.35	567.50	568.25	568.60	......	571.50	568.55	*a*
31	566.80	566.60	......	567.50	......	568.15	568.50	......	570.25	......	*a*

a No record. NOTE.— Station discontinued May 31, 1919.

SCHOHARIE CREEK AT FORT HUNTER

Gage No. 156

This station, located on Schoharie creek above the State feeder dam at Fort Hunter, was originally established by the U. S. Deep Waterways Survey, September 24, 1898. Reëstablished November 17, 1904, in coöperation with the U. S. Weather Bureau, it is now maintained by this Department. Because of unfavorable conditions, increased leakage and indeterminate diversion for the supply of the Erie canal, discharge estimates were discontinued December 31, 1914. A chain gage on the downstream side near the south end of the highway bridge about 500 feet above the dam is read twice daily — A. M. and P. M. — to tenths.

Daily elevation of water-surface (B. C. datum) of SCHOHARIE CREEK AT FORT HUNTER, for the year ended June 30, 1919. C. E. Wing, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	280.6	279.5	279.35	281.5	281.45	281.25	282.25	282.1	282.4	282.2	281.75
2	280.5	279.45	279.45	281.5	281.6	281.05	282.75	282.0	282.8	282.1	281.85
3	280.35	279.4	279.45	281.85	281.5	281.0	282.45	282.1	282.3	282.15	281.85
4	280.3	279.25	279.5	281.5	281.5	280.9	282.25	282.25	282.05	282.3	281.7
5	280.35	279.15	279.65	281.4	281.4	280.9	282.05	282.2	282.2	282.6	281.65
6	280.3	279.1	279.7	281.4	281.3	280.8	281.9	282.05	282.1	282.95	281.6
7	280.3	279.1	279.6	281.45	281.3	280.75	281.8	281.85	281.9	282.85	281.75
8	280.3	279.2	279.5	281.5	281.35	280.7	281.85	281.7	281.85	283.2	281.75
9	280.25	279.25	279.4	281.5	281.3	280.7	282.0	281.45	282.3	283.05	281.8
10	280.2	279.45	279.4	281.5	281.2	280.6	282.0	281.35	282.5	283.2	282.0
11	280.2	279.5	279.35	281.35	281.2	280.85	282.0	281.25	282.6	283.0	283.2
12	280.2	279.5	279.3	281.2	281.1	281.1	282.0	281.15	282.2	283.65	283.35
13	280.2	279.4	279.25	281.2	281.1	281.3	282.05	281.0	282.2	283.45	283.2
14	280.2	279.55	279.25	281.2	281.1	281.75	282.25	281.4	282.1	283.25	283.25
15	280.25	279.65	279.3	281.2	281.1	282.05	282.55	281.65	281.9	282.7	283.0
16	280.2	279.4	279.3	281.2	281.05	282.0	282.75	281.7	281.9	282.4	282.65
17	280.35	279.2	279.4	281.1	281.0	281.85	282.8	281.5	282.35	282.65	282.4
18	280.25	279.2	279.4	281.1	281.0	281.75	282.85	281.35	282.75	282.6	282.25
19	280.2	279.3	279.4	281.0	281.55	281.7	282.75	281.2	282.45	282.4	282.45
20	280.2	279.3	279.5	281.0	281.5	281.6	282.75	281.15	282.4	282.25	282.4
21	280.1	279.15	279.75	281.25	281.5	281.5	282.65	281.35	282.3	282.05	282.35
22	280.0	279.05	279.9	281.25	281.5	281.5	282.5	281.2	282.2	281.9	282.3
23	279.95	278.9	280.35	281.2	281.5	281.95	282.65	281.2	282.1	281.8	282.3
24	279.85	278.8	281.15	281.1	281.5	282.25	282.75	281.25	281.95	281.75	282.3
25	279.65	278.95	281.05	281.1	281.4	282.3	283.25	281.2	281.8	281.95	282.3
26	279.5	279.1	281.3	281.0	281.4	282.45	283.15	281.2	281.7	281.95	282.55
27	279.4	279.4	282.15	281.15	281.3	282.25	283.0	281.2	281.85	281.8	282.25
28	279.4	279.6	282.25	281.2	281.15	282.05	282.9	281.15	282.3	281.7	282.05
29	279.35	279.4	281.85	281.05	281.25	281.95	282.75	......	282.8	281.85	281.9
30	279.4	279.15	281.6	281.0	281.4	282.0	282.45	......	282.3	281.75	281.7
31	279.5	279.2	......	281.35	......	282.1	282.35	......	282.15	......	281.55

NOTE.— Station discontinued May 31, 1919.

ESOPUS CREEK

DESCRIPTION

Esopus creek has its source in Winnisook lake on the northwestern slope of Slide mountain, the highest peak of the Catskills. From Big Indian to Ashokan reservoir the stream flows through a deep valley, flanked on both sides by timber-covered mountains. Numerous sites for dams or storage reservoirs are offered at points where the valley broadens out for a short distance to receive the inflowing waters of tributaries. The stream channel is relatively broad and shallow. The bed is covered with cobbles and small boulders left behind after the erosion of drift deposits, which formerly filled the valley. The drainage basin of Esopus creek is shown on the Margaretville, Phoenicia, Kaaterskill, Catskill, Slide Mountain, Rosendale and Rhinebeck sheets of the U. S. Geological Survey topographic maps. This stream is of great economical importance, owing to its relatively large yield and its location. The Ashokan reservoir, with a water-surface of 12 square miles and a total drainage area above the dam of 257 square miles, is one of the sources of water-supply for New York city.

Drainage areas of ESOPUS CREEK *
(From U. S. G. S. topographic maps)

LIMITS	AREA IN SQUARE MILES	
	Place to place	Total
Beaver Kill (Mink Hollow)		
Source to about ¾ mile north of Lake Hill	8.42	8.42
ESOPUS CREEK		
Source to Coldbrook, at highway bridge	183.72	192.14
Coldbrook to Olive Bridge dam	64.38	256.52
Olive Bridge dam to pulp-mill, about 1¾ miles south of Brown's Station	7.01	263.53
Pulp-mill to Kingston, at highway bridge	53.54	317.07
Saw Kill		
Source to about 4½ miles below Woodstock	32.99	....
ESOPUS CREEK		
Kingston to Leggs Mills, about ⅓ mile northwest of Lake Katrine railroad station	19.72	369.78
Plattekill Creek		
Source to below pond, about 2 miles east of West Saugerties	17.35	387.13
ESOPUS CREEK		
Leggs Mills to Glenerie, about 1 mile south of Mount Marion station at dam below W. S. R. R. bridge	28.95	416.08
Glenerie to Mount Marion, at highway bridge	2.13	418.21
Mount Marion to Saugerties, at dam below, highway bridge	6.00	424.21

* This table of drainage areas is the result of a joint determination of areas, based on independent computations by the engineers of the Board of Water Supply of the city of New York and of the Department of State Engineer.

ESOPUS CREEK AT COLDBROOK

Location.—At highway bridge about 1,000 feet above Coldbrook railroad station on U. & D. R. R.; about 6 miles west of Ashokan.

Drainage area.— 192 square miles. (Measured on U. S. Geological Survey topographic maps.)

Records available.—August 27, 1913, to June 30, 1919.

Gages.— Standard B. W. S. chain gage, read twice daily. On June 15, 1916, a Friez automatic register was installed. These gages are located on the downstream side of the highway bridge.

Discharge measurements.— At low stages, made by wading; at high stage, from the highway bridge (clear span of 160 feet).

Control.— Coarse gravel, apparently permanent, and numerous small boulders and some riprap. Channel above station straight for about three hundred feet; water swift. Channel below station straight for about one thousand feet; water swift. Right bank high, grassed and largely covered with brush, not liable to overflow. Left bank high, wooded, not liable to overflow.

Extremes of discharge.— Current year: Maximum stage, 8.95 feet on March 28 at 2 A. M.; discharge, 6,220 second-feet. Minimum stage recorded, 3.09 feet on August 28; discharge, 16 second-feet.

1913–1919: Maximum stage recorded, 12.75 feet on November 9, 1913, at 8 P. M.; discharge, about 21,400 second-feet. Minimum stage recorded, 3.21 feet on October 14, 1914; discharge, 8 second-feet.

Winter flow.— Discharge relation seriously affected by ice. Flow determined by meter and float measurements and climatological data.

Accuracy.—Discharge rating curve well defined up to a gage height of 10 feet.

Coöperation.—Established and maintained by the Board of Water Supply of the city of New York. Turbidity and climatological observations are made at this station.

Daily discharge, in second-feet, of ESOPUS CREEK AT COLDBROOK, for the year ended June 30, 1919. Philip Dwyer and J. H. Joyce, Observers

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	138	41	232	183	216	174	470	238	1,730	e850	360	355
2	136	34	84	158	201	171	m674	235	1,001	e695	511	319
3	134	33	66	163	189	166	613	228	716	660	395	283
4	134	38	56	148	183	166	535	222	607	681	400	241
5	116	54	40	136	174	155	460	207	m625	688	435	222
6	134	31	45	177	166	143	440	195	667	780	400	219
7	129	26	41	186	163	136	415	m186	559	864	400	210
8	110	23	40	163	160	174	410	183	485	1,064	390	180
9	m98	26	45	155	158	180	365	160	1,580	1,019	425	195
10	91	30	34	148	140	158	299	145	1,833	888	888	180
11	89	77	30	145	131	138	295	131	1,240	965	1,500	m166
12	91	49	30	136	127	166	235	150	929	1,800	1,540	148
13	98	m38	52	131	120	153	279	153	758	1,390	1,500	138
14	94	36	45	127	114	213	360	207	613	1,120	1,250	148
15	94	31	38	120	112	565	287	213	511	m920	992	222
16	84	27	34	114	110	517	255	186	495	1,046	m816	216
17	91	24	34	118	123	470	238	158	505	1,800	1,330	180
18	84	23	79	112	299	425	225	143	983	1,400	1,340	163
19	71	m23	96	106	323	385	219	123	896	1,140	1,055	155
20	71	21	84	114	279	347	207	145	793	929	888	158
21	66	19	189	134	245	331	198	136	786	779	1,019	174
22	61	21	136	127	m238	430	195	150	772	653	1,700	140
23	64	28	108	110	245	1,300	210	138	667	565	m1,987	118
24	73	m23	94	110	216	1,130	583	143	607	589	1,510	116
25	m66	20	94	108	207	1,700	415	131	541	535	1,190	106
26	59	19	607	110	186	1,210	390	259	495	490	929	m123
27	54	17	695	106	177	896	360	183	646	440	751	365
28	44	16	365	106	177	716	339	201	3,005	415	613	311
29	46	m24	255	100	235	601	m323	......	1,670	395	517	207
30	51	26	201	110	204	541	307	......	e1,200	351	445	183
31	51	87	......	m228	......	475	275	......	e1,000	......	400	......
Mean	88	32	132	135	187	462	351	177	933	862	899	198

m Meter measurement. *e* Estimated.

Monthly discharge of ESOPUS CREEK AT COLDBROOK, for the year ended June 30, 1919

[Drainage area, 192 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	138	44	88	0.45	0.530
August	87	16	32	0.17	0.196
September	695	30	132	0.69	0.770
October	228	100	135	0.70	0.807
November	323	110	187	0.97	1.082
December	1,700	136	462	2.41	2.778
January	674	195	351	1.83	2.110
February	259	123	177	0.92	0.958
March	3,005	485	933	4.86	5.603
April	1,800	351	862	4.49	5.009
May	1,987	360	899	4.68	5.396
June	365	106	198	1.03	1.149
The year	3,005	16	371	1.93	26.388

RONDOUT CREEK

DESCRIPTION

Rondout creek has its source in the heart of the timber-covered mountain group forming Wittenberg chain. It flows southeasterly to Napanoch, where it encounters the foot of Shawangunk range, turns abruptly to the northeast and enters the Hudson river at Rondout. Its watershed on the south is very restricted, as it is separated from the Wallkill river by only the narrow Shawangunk ridge. Notable waterfalls occur at Honk falls and Napanoch over Hudson river shale, and on Good Beer kill above Ellenville. At Honk falls a natural declivity afforded a fall of 125 feet, which has been increased to 147.5 feet by the construction of a masonry dam at the head of the gorge. On Good Beer kill there is a total fall of 870 feet from the Cape, 3 miles above Ellenville, to Ellenville. Of this about 200 feet are concentrated in a series of cascades, called Hanging Rock falls.

Water-power was originally developed at Napanoch in 1754. There is in this village a total fall of 115 feet. A series of cascades, involving a descent of about 50 feet, occurs at High Falls, where the water flows over Rosendale cement rock.

Drainage areas of RONDOUT CREEK *
(From U. S. G. S. topographic maps)

LIMITS	AREA IN SQUARE MILES	
	Place to place	Total
Source to Lackawack dam site, at Lackawack	94.73	94.73
Lackawack dam site to Lackawack gage, at Wilbur's bridge	5.63	100.36
Lackawack gage to Honk falls, about 1 mile above Napanoch	1.68	102.04
Honk falls to Alligerville, at highway bridge (including Vernooy)	243.78	345.82
Alligerville to High Falls, at High Falls dam	19.31	365.13
High Falls to Rosendale, at highway bridge	21.17	386.30

* This table is the result of a joint determination of drainage areas, based on independent computations by the engineers of the Board of Water Supply of the city of New York and of the Department of State Engineer.

RONDOUT CREEK AT LACKAWACK

Location.—At highway bridge, known as Wilbur's bridge, about 3 miles from Lackawack on road to Napanoch (reached by Ontario and Western railroad from Kingston to Napanoch and then a distance of 4 miles by Grahamsville stage).

Drainage area.— 100 square miles,* determined from U. S. G. S. topographic maps and by special survey of part of watershed line by Board of Water Supply. (1910–1912, inclusive, drainage area considered 104 square miles, based on incomplete data.)

Records available.— May 1, 1910, to June 30, 1918. (Honk falls† records available, February 13, 1906, to April 30, 1910, inclusive.)

Gage.— Standard Board of Water Supply chain gage and Friez automatic stage register, read twice daily.

Discharge measurements.—At high stages, from highway bridge. At low stages, by wading at a point about a mile below Wilbur's bridge, where bottom is gravelly.

Control.— Sandy bottom from Sta. 0 to 45. Station 45 to 85 strewn with boulders. Section apparently permanent. Clear span, 85 feet. Channel above station straight for about 3,000 feet; water swift. Channel below station straight for about 1,000 feet; water swift. Right bank high, wooded. Left bank high, clean.

Extremes of discharge.— Current year: Maximum stage recorded, 6.83 feet on March 1, at 8 A. M.; discharge, 2,710 second-feet. Minimum stage recorded, 2.11 feet on August 18, 21, 27 and 28; discharge, 14 second-feet.

1910–1919: Maximum stage recorded, 10.40 feet on November 9, 1913, at 7:30 P. M.; discharge, 14,000 second-feet. Minimum stage recorded, 2.07 feet on October 8, 1914, and 2.11 feet on August 18, 21, 27 and 28, 1918; discharge, 14 second-feet.

Winter flow.— Discharge relation seriously affected by ice when channel is completely frozen over. Flow determined by meter measurements and climatological data.

Accuracy.— Discharge rating curve well defined.

Coöperation.— Established and maintained by Board of Water Supply of the city of New York. Climatological observations are made at this station.

* The 100 square miles used above is checked by the result of a joint determination of drainage areas, based on independent computations by engineers of the Board of Water Supply of the city of New York and of the Department of State Engineer.

† Honk Falls is a short distance below this station.

Daily discharge, in second-feet, of RONDOUT CREEK AT LACKAWACK, for the year ended June 30, 1919. Frank J. Thoneman, Observer

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	82	30	206	134	177	125	294	154	806	345	204	147
2	87	m24	66	124	152	114	690	145	418	306	444	136
3	65	21	40	124	140	114	453	149	306	294	281	124
4	59	20	30	114	138	114	366	145	273	313	235	116
5	57	27	24	108	140	111	287	143	290	306	223	109
6	48	27	28	185	132	109	303	m134	319	284	213	109
7	57	23	35	185	124	109	290	127	259	264	211	121
8	50	19	25	141	121	117	267	127	235	262	213	101
9	43	19	29	129	117	129	246	125	716	259	211	113
10	m45	19	m23	119	116	122	208	113	788	251	546	113
11	48	35	21	106	113	116	206	106	512	m264	617	87
12	54	42	20	97	108	124	158	117	395	581	444	78
13	61	27	25	100	106	125	187	114	342	391	m402	72
14	68	24	29	97	106	177	204	181	m297	332	345	71
15	81	31	29	87	103	711	181	196	248	306	303	138
16	57	25	31	82	100	440	159	163	264	536	276	218
17	51	20	26	78	97	326	158	125	294	824	517	136
18	57	14	57	76	284	267	161	116	602	541	586	m113
19	47	17	97	72	251	230	167	100	466	426	406	93
20	57	15	72	75	196	211	158	103	395	362	352	84
21	40	14	154	213	173	194	152	101	373	326	338	89
22	37	m16	98	136	163	352	150	103	332	287	380	71
23	33	15	71	116	154	1,150	173	106	278	262	414	65
24	31	17	59	106	145	818	522	109	259	329	355	58
25	33	15	48	103	141	1,081	m264	111	238	322	342	54
26	31	15	586	109	m136	654	235	256	223	267	281	59
27	27	14	565	116	134	462	216	165	259	243	251	147
28	24	14	259	116	121	373	199	147	1,134	225	228	129
29	24	20	185	111	167	306	192	......	591	225	211	89
30	31	27	150	225	143	270	183	......	479	206	192	76
31	37	33	......	238	......	243	175	......	410	......	173	......
Mean	49	22	103	123	143	316	245	135	413	338	329	104

m Meter measurement.
NOTE.— Flow based on meter measurements and climatalogical data.

Monthly discharge of RONDOUT CREEK AT LACKAWACK, for the year ended June 30, 1919

[Drainage area, 100 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	87	24	49	0.49	0.565
August	42	14	22	0.22	0.254
September	586	20	103	1.03	1.149
October	238	72	123	1.23	1.418
November	284	97	143	1.43	1.595
December	1,150	109	316	3.16	3.643
January	690	150	245	2.45	2.825
February	256	100	135	1.35	1.406
March	1,134	223	413	4.13	4.761
April	824	206	338	3.38	3.771
May	617	173	329	3.29	3.793
June	218	54	104	1.04	1.160
The year	1,150	14	193	1.93	26.340

RONDOUT CREEK AT ROSENDALE

Location.— Rosendale highway bridge, downstream side. Reached by Wallkill Valley railroad from Kingston.

Drainage area.— 386 square miles,* determined from U. S. G. S. topographic maps and by special survey of part of watershed line by Board of Water Supply. (1907 to 1912, inclusive, area considered 380 square miles, based on government records for year 1903.)

Records available.— January 1, 1907, to June 30, 1919.†

Gage.—Standard Board of Water Supply chain gage, read twice daily.

Discharge measurements.— At high stages, from highway bridge. At low stages, by wading at point about 1 mile below bridge, where river bed is gravelly.

Control.— River bed smooth, ledge-rock bottom. Clear span of 136 feet. Channel above and below station straight for about 300 feet. Banks high, rocky and slightly wooded, not liable to overflow.

Extremes of discharge.— Current year: Maximum stage recorded, 10.87 feet on December 23, as observed on chain gage at 7:30 A. M.; discharge, 4,900 second-feet. Minimum stage recorded, 5.94 feet on August 10; discharge, 45 second-feet.

1907–1919: Maximum stage recorded, 18.57 feet on April 26, 1910, at 4:30 P. M.; discharge, 21,600 second-feet. Minimum stage recorded, 5.77 feet on August 30 and September 1 to 3, 1907; discharge, 20 second-feet.

Winter flow.— Discharge relation seriously affected by ice. Flow determined by meter measurements and climatological data.

Diversion.— The Delaware and Hudson canal, which is abandoned above High Falls, draws its supply of water from the natural flow of Rondout creek at a point above Rosendale. A 3-foot staff gage is read at Rock Locks when water of Delaware and Hudson canal is discharged through rock channel, 3.4 feet wide, formed by masonry wall of lock near entrance and left bank wall. Stop-planks are placed to form weir, and discharge is com-

* The 386 square miles used above is checked by the result of a joint determination of drainage areas, based on independent computations by the engineers of the Board of Water Supply of the city of New York and of the Department of State Engineer.

† Established July 6, 1901, by the United States Geological Survey in coöperation with the New York City Water Supply Departments and taken over by the Board of Water Supply, June 1, 1907.

puted by weir formula and added to Rosendale bridge discharge for final record. From time to time measurements are made to check weir discharge. Canal is operated only during summer months, on a small scale.

Regulation.—At Honk falls dam, above Napanoch, and at High Falls, where power-houses are located, operations affect the natural flow of the creek.

Accuracy.— Discharge rating curve fairly well defined.

Coöperation.— Maintained by Board of Water Supply of the city of New York. Climatological observations are made at this station.

Daily discharge, in second-feet, of RONDOUT CREEK AT ROSENDALE, for the year ended June 30, 1919. Edward J. Huben, Observer

DAY	July†	Aug.†	Sept.†	Oct.†	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	116	123	263	311	530	311	751	......	......	......	......	......
2	226	m 73	228	235	355	325	1,961	......	......	......	......	......
3	187	77	151	311	298	340	1,595	......	......	......	......	......
4	133	71	119	259	332	394	1,328	......	......	......	......	......
5	113	96	101	203	340	318	801	......	......	......	......	......
6	127	61	91	186	272	259	976	......	......	......	......	......
7	158	58	84	624	285	i 229	835	......	......	......	......	......
8	92	73	73	329	285	272	801	......	......	......	......	......
9	233	54	75	258	272	311	801	......	......	......	......	......
10	m 186	45	m 65	264	229	i 259	751	......	......	......	......	......
11	145	59	63	224	178	i 259	i 734	......	......	......	......	......
12	164	58	58	208	152	i 318	i 570	......	......	......	......	......
13	123	51	73	187	224	362	i 650	......	......	......	......	......
14	254	65	77	204	253	602	i 692	......	......	......	......	......
15	377	63	65	257	259	2,242	i 650	......	......	......	......	......
16	242	73	58	235	229	1,695	i 570	......	......	......	......	......
17	180	58	54	200	207	1,136	538	......	......	......	......	......
18	199	52	73	197	961	892	586	......	......	......	......	......
19	188	58	100	192	1,185	717	570	......	......	......	......	......
20	149	54	168	173	667	618	i 554	......	......	......	......	......
21	116	51	357	144	554	586	i 488	......	......	......	......	......
22	94	m 52	338	365	496	562	471	......	......	......	......	......
23	124	51	162	† 291	402	4,268	454	......	......	......	......	......
24	91	52	187	202	340	1,917	2,137	......	......	......	......	......
25	133	48	131	235	362	4,268	1,056	......	......	......	......	......
26	92	54	184	235	370	2,350	900	......	......	......	......	......
27	77	52	1,914	218	m 370	2,027	801	......	......	......	......	......
28	84	51	806	174	285	1,211	658	......	......	......	......	......
29	63	54	488	224	386	908	618	......	......	......	......	......
30	61	69	386	247	355	843	562	......	......	......	......	......
31	137	91	......	386	......	726	530	......	......	......	......	......
Mean	150	63	233	251	381	1,017	819	......	......	......	......	......

m Meter measurement. † Includes flow of D. & H. canal. i Ice conditions.

NOTE.— Water was let into D. & H. canal on April 28, 1918, and discharged October 23, 1918. Flow under ice conditions based on meter measurements and climatological data. Station discontinued January 31, 1919.

Monthly discharge of RONDOUT CREEK AT ROSENDALE, for the year ended June 30, 1919

[Drainage area, 386 square miles]

Month	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	377	61	150	0.39	0.450
August	123	45	63	0.16	0.184
September	1,914	54	233	0.60	0.669
October	624	144	251	0.65	0.749
November	1,185	152	381	0.99	1.104
December	4,268	229	1,017	2.63	3.032
January	2,137	454	819	2.12	2.444

NOTE.— Station discontinued January 31, 1919.

HUDSON RIVER BASIN —MISCELLANEOUS MEASUREMENTS

Miscellaneous measurements in HUDSON RIVER DRAINAGE BASIN, for the year ended June 30, 1919

Date	Stream	Locality	Gage height	Discharge
1918			*Feet*	*Sec.-ft.*
Aug. 22	Battenkill	Greenwich	......	67.7
Oct. 28	Power canal	Cohoes Power Co.'s plant	......	2,830
1919				
May 7	Cedar river	Indian Lake	3.64	130
June 19	Hudson river	Lake Harris	......	306

DELAWARE RIVER DRAINAGE BASIN

DELAWARE RIVER

DESCRIPTION

The headwaters of Delaware river are found in Delaware, Greene and Schoharie counties. The East branch, which may be considered the main stream, rises at Grand Gorge in northeastern Delaware county; the West branch has its source in a small lake almost on the line of Schoharie and Delaware counties, at an elevation of 1,886 feet above sea-level; the two streams unite at Hancock, forming what is referred to as the Delaware river, while above this point the two branches are designated as East or West branch, Delaware river. From this junction point the river flows southeastward until it reaches Port Jervis, where it turns to the southwest and flows for a distance of about 40 miles along the base of the Shawangunk range until it passes through the water gap, from which point it flows in an irregular southerly direction to Trenton, N. J. Below Trenton its course is in general southwestward to Delaware bay. Between Hancock and Port Jervis it forms the dividing line between New York and Pennsylvania; south of Port Jervis it separates Pennsylvania from New Jersey and, for a few miles, Delaware from New Jersey.

The drainage area of Delaware river, measured at Philadelphia, Pa., and including that of Schuylkill river, is about 10,100 square miles, of which about 2,580 square miles lie in New York, 5,720 in Pennsylvania, and 1,800 in New Jersey. The river is tidal to Trenton, which lies also at the head of navigation.

The Delaware receives a number of important tributaries, among which may be mentioned Mongaup and Neversink rivers and Callicoon creek from New York; Lackawaxen, Lehigh and Schuylkill rivers and numerous creeks from Pennsylvania; and Rancocas creek, Musconetcong river and Maurice river from New Jersey.

EAST BRANCH OF DELAWARE RIVER AT FISH EDDY

Location.—At the railway bridge in the village of Fish Eddy, Delaware county, about 4 miles below the mouth of Beaver kill and 5½ miles above the confluence of East and West branches.

Drainage area.— 790 square miles. (Measured on post-route map.)

Records available.—November 19, 1912, to June 30, 1919. Records were obtained at Hancock, about 4 miles below, from October 14, 1902, to December 31, 1912.

Gage.— Staff in two sections on downstream and on left pier of railroad bridge; read by J. P. Lyons.

Discharge measurements.— Made from the highway bridge about 200 feet above the gage or by wading.

Channel and control.— Coarse gravel; occasionally shifting.

Extremes of discharge.— Current year: Maximum stage recorded, 8.4 feet at 4 P. M., April 12; discharge, 8,390 second-feet. Minimum stage recorded, 1.7 feet several times in August and September; discharge, 141 second-feet.

1912–1919: Maximum stage, 17.4 feet during the afternoon of March 27, 1913, determined by leveling from flood-marks; discharge, about 33,500 second-feet. Minimum stage recorded, 1.64 feet at 5 P. M., October 12, 14 and 15, 1914; discharge, 97 second-feet.

Ice.—Stage-discharge relation seriously affected by ice.

Accuracy.— Stage-discharge relation apparently permanent; usually affected by ice during much of the period from December to March, inclusive. Rating curve well defined between 200 and 20,000 second-feet. Gage read to hundredths twice daily. Discharge ascertained by applying mean daily gage height to rating table. Records good except for periods when the stage-discharge relation was affected by ice, for which they are fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the U. S. Weather Bureau and the State Engineer and Surveyor.

Discharge measurements of EAST BRANCH OF DELAWARE RIVER AT FISH EDDY, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Aug. 15.......	E. D. Burchard..................................	2.08	243
1919			
Mar. 15.......	J. W. Moulton..................................	4.25	1,770
May 8.......	J. W. Moulton..................................	3.92	1,480

Daily gage height, in feet, of EAST BRANCH OF DELAWARE RIVER AT FISH EDDY, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	2.7	2.0	2.3	3.3	3.5	2.9	4.6	3.4	5.5	*a*	4.6	2.9
2.....	2.6	2.0	2.4	3.2	3.5	2.9	6.9	3.3	5.6	*a*	4.7	2.8
3.....	2.6	2.0	2.2	3.0	3.5	2.9	6.0	3.3	5.0	4.2	4.6	2.75
4.....	2.5	2.0	2.05	3.0	3.45	2.8	5.1	3.2	4.7	4.6	4.4	2.75
5.....	2.4	2.0	2.0	3.0	3.4	2.65	4.9	3.2	4.7	5.4	4.2	2.7
6.....	2.4	2.0	1.85	5.3	3.4	2.5	4.6	3.1	4.6	5.8	4.2	2.7
7.....	2.4	1.95	1.80	5.0	3.3	2.5	4.4	3.0	4.6	5.7	4.0	2.65
8.....	2.4	1.95	1.78	4.6	3.3	2.5	4.3	2.8	4.4	5.6	3.9	2.65
9.....	2.4	1.90	1.70	4.4	3.2	2.6	4.3	2.7	5.5	5.5	4.7	2.6
10.....	2.45	1.90	1.70	4.1	3.1	2.7	4.2	2.65	5.4	5.6	5.6	2.6
11.....	2.6	1.90	1.70	4.0	3.1	2.8	4.2	2.6	4.8	6.2	6.5	2.6
12.....	2.5	1.90	1.70	3.8	2.95	2.8	4.2	2.55	4.4	8.3	6.4	2.6
13.....	2.25	2.00	1.70	3.8	2.8	3.2	4.2	2.55	4.2	7.9	6.3	2.5
14.....	2.15	2.0	1.70	3.8	2.7	3.8	4.1	3.5	4.2	6.4	6.2	2.5
15.....	2.15	2.05	1.70	3.6	2.7	5.7	4.1	3.3	4.2	6.3	5.5	3.6
16.....	2.2	2.0	1.70	3.45	2.7	5.2	3.9	3.3	4.2	6.4	5.0	3.8
17.....	2.45	1.90	1.80	3.3	2.8	4.8	3.7	3.2	4.4	6.6	4.8	3.3
18.....	2.6	1.85	1.80	3.2	3.1	4.7	3.5	2.85	5.8	6.2	5.4	3.2
19.....	2.5	1.82	1.90	3.2	3.1	4.6	3.5	2.8	5.7	6.2	5.1	2.95
20.....	2.4	1.80	2.1	3.3	3.1	4.2	3.5	2.8	5.6	5.8	5.0	2.75
21.....	2.3	1.80	2.55	3.4	3.0	3.8	3.4	2.75	5.4	5.2	4.8	2.7
22.....	2.3	1.75	2.85	3.5	3.0	3.8	3.4	2.7	5.2	5.2	5.0	2.65
23.....	2.25	1.75	2.5	3.5	3.0	7.4	3.6	2.65	4.7	4.4	5.4	2.5
24.....	2.2	1.70	2.4	3.6	3.0	7.8	5.3	2.65	4.5	4.3	5.1	2.2
25.....	2.2	1.70	2.55	3.7	3.0	5.6	4.6	2.65	4.5	4.2	4.6	2.2
26.....	2.2	1.70	2.5	3.6	3.0	5.2	4.2	2.65	4.4	4.0	4.3	2.2
27.....	2.15	1.70	5.8	3.5	3.0	4.7	3.8	2.65	6.0	4.0	4.2	2.6
28.....	2.1	1.70	4.4	3.5	2.95	4.6	3.6	2.8	6.2	3.9	4.2	3.2
29.....	2.0	1.70	4.0	3.5	2.9	4.4	3.5	......	5.9	3.9	4.1	2.75
30.....	2.0	1.70	3.4	3.5	2.9	4.3	3.4	......	4.9	4.1	3.9	2.65
31.....	2.0	1.80	......	3.5	......	4.3	3.4	......	4.8	......	3.35	......

a No record.

Daily discharge, in second-feet, of EAST BRANCH OF DELAWARE RIVER AT FISH EDDY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	530	228	340	920	1,080	650	2,100	1,000	3,180	2,200	2,100	650
2	480	228	385	850	1,080	650	5,440	920	3,320	2,000	2,210	590
3	480	228	300	710	1,080	650	3,910	920	2,550	1,690	2,100	560
4	430	228	245	710	1,040	590	2,670	850	2,210	2,100	1,890	560
5	385	228	228	710	1,000	505	2,430	850	2,210	3,050	1,690	530
6	385	228	183	2,920	1,000	430	2,100	780	2,100	3,610	1,690	530
7	385	213	168	2,550	920	430	1,890	710	2,100	3,460	1,500	505
8	385	213	163	2,100	920	430	1,790	590	1,890	3,320	1,410	505
9	385	198	141	1,890	850	480	1,790	530	3,180	3,180	2,210	480
10	408	198	141	1,590	780	530	1,690	505	3,050	3,320	3,320	480
11	480	198	141	1,500	780	590	1,690	480	2,320	4,230	4,730	480
12	430	198	141	1,320	680	590	1,690	455	1,890	8,180	4,560	480
13	320	228	141	1,320	590	850	1,690	455	1,690	7,360	4,390	430
14	281	228	141	1,320	530	1,320	1,590	1,080	1,690	4,560	4,230	430
15	281	245	141	1,160	530	3,460	1,590	920	1,690	4,390	3,180	1,160
16	300	228	141	1,040	530	2,790	1,410	920	1,690	4,560	2,550	1,320
17	408	198	168	920	590	2,320	1,240	850	1,890	4,900	2,320	920
18	480	183	168	850	780	2,210	1,080	620	3,610	4,230	3,050	850
19	430	174	198	850	780	2,100	1,080	590	3,460	4,230	2,670	680
20	385	168	262	920	780	1,690	1,080	590	3,320	3,610	2,550	560
21	340	168	455	1,000	710	1,320	1,000	560	3,050	2,790	2,320	530
22	340	154	620	1,080	710	1,320	1,000	530	2,790	2,790	2,550	505
23	320	154	430	1,080	710	6,380	1,160	505	2,210	1,890	3,050	430
24	300	141	385	1,160	710	7,160	2,920	505	1,990	1,790	2,670	300
25	300	141	455	1,240	710	3,320	2,100	505	1,990	1,690	2,100	300
26	300	141	430	1,160	710	2,790	1,690	505	1,890	1,500	1,790	300
27	281	141	3,610	1,080	710	2,210	1,320	505	3,910	1,500	1,690	480
28	262	141	1,890	1,080	680	2,100	1,160	590	4,230	1,410	1,690	850
29	228	141	1,500	1,080	650	1,890	1,080	......	3,760	1,410	1,590	560
30	228	141	1,000	1,080	650	1,790	1,000	......	2,430	1,590	1,410	505
31	228	168	......	1,080	......	1,790	1,000	......	2,320	......	960	......
Mean	360	189	490	1,230	776	1,780	1,790	672	2,570	3,220	2,460	582

NOTE.—Stage-discharge relation not affected by ice. Gage height estimated by observer, October 20 to 26. Discharge estimated, April 1 and 2, by comparing hydrograph of West branch of Delaware river at Hale Eddy.

Monthly discharge of EAST BRANCH OF DELAWARE RIVER AT FISH EDDY, for the year ended June 30, 1919

[Drainage area, 790 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	530	228	360	0.456	0.53
August	245	141	189	0.239	0.28
September	3,610	141	490	0.620	0.69
October	2,920	710	1,230	1.56	1.80
November	1,080	530	776	0.980	1.09
December	7,160	430	1,780	2.25	2.59
January	5,440	1,000	1,790	2.27	2.62
February	1,080	455	672	0.851	0.89
March	4,230	1,690	2,570	3.25	3.75
April	8,180	1,410	3,220	4.08	4.55
May	4,730	960	2,460	3.11	3.58
June	1,320	300	582	0.737	0.82
The year	8,180	141	1,343	1.70	23.19

DELAWARE RIVER AT PORT JERVIS

Location.—At the toll bridge at Port Jervis, Orange county, 1 mile above Neversink river and 6 miles below Mongaup river.

Drainage area.— 3,250 square miles.

Records available.— October 12, 1904, to June 30, 1919.

Gage.— Staff, in two sections, the lower section inclined, about 30 feet downstream, from left abutment of bridge; the upper section vertical and attached to downstream end of left abutment. Read by John Bisland.

Discharge measurements.— Made from the highway bridge or by wading.

Channel and control.— Gravel; occasionally shifting.

Extremes of discharge.— Current year: Maximum stage recorded, 7.12 feet at 5 P. M., March 10; discharge, 21,300 second-feet. Minimum stage recorded, 1.10 feet at 8 A. M. and 5 P. M., August 26 and 28; discharge, 390 second-feet.

1904–1919: Maximum stage recorded, 16.0 feet at 8 A. M., March 28, 1914; discharge, 92,700 second-feet. Minimum stage recorded, 0.60 foot at 8 A. M., September 22 and 23, 1908; discharge, 175 second-feet.

Ice.— Stage-discharge relation somewhat affected by ice.

Accuracy.— Stage-discharge relation practically permanent between dates of shifting; affected by ice during large part of January and February. Rating curve well defined between 1,000 and 30,000 second-feet. Gage read to tenths once daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good for periods when the stage-discharge relation is not affected by ice and fairly good for other periods.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the U. S. Weather Bureau and the State Engineer and Surveyor.

Discharge measurements of DELAWARE RIVER AT PORT JERVIS, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
		Feet	*Sec.-ft.*
1918			
Aug. 13........	E. D. Burchard..................................	1.50	650
Aug. 13........	E. D. Burchard..................................	1.53	657
1919			
May 10........	J. W. Moulton..................................	3.80	5,310
June 25........	C. C. Covert..................................	2.12	1,360

Daily gage height, in feet, of DELAWARE RIVER AT PORT JERVIS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	2.5	1.6	1.65	2.9	4.5	2.7	3.9	3.2	4.3	4.4	3.6	3.1
2.....	2.3	1.7	1.7	2.8	4.1	2.5	4.4	3.3	6.3	4.1	3.8	2.9
3.....	2.5	1.6	1.9	2.7	3.7	2.45	5.6	2.7	5.4	4.0	4.3	2.8
4.....	2.4	1.55	1.75	2.8	3.5	2.45	5.1	2.6	4.8	3.9	4.0	2.7
5.....	2.25	1.6	1.6	2.9	3.1	2.45	4.4	2.8	4.5	4.4	3.7	2.6
6.....	2.0	1.5	1.6	3.0	3.5	2.35	3.8	2.8	4.5	4.6	3.6	2.5
7.....	2.0	1.45	1.5	5.7	3.3	2.3	3.9	2.6	4.5	4.7	3.5	2.7
8.....	2.1	1.5	1.45	4.7	3.3	2.25	4.2	2.4	4.2	4.7	3.5	2.7
9.....	2.2	1.5	1.4	4.0	2.9	2.4	4.2	2.4	4.5	4.9	3.5	2.7
10....	2.1	1.55	1.3	3.6	2.8	2.5	3.9	2.3	7.0	4.8	4.3	2.5
11....	2.1	1.55	1.25	3.4	2.7	2.35	3.4	2.2	6.1	4.5	6.2	2.45
12.....	2.15	1.5	1.25	3.3	2.7	2.35	3.3	2.2	5.5	6.3	6.0	2.4
13.....	2.15	1.6	1.25	3.2	2.6	2.6	3.1	2.2	5.1	6.8	5.7	2.3
14.....	2.2	1.6	1.35	3.1	2.5	2.8	3.1	2.45	4.6	5.9	5.5	2.2
15.....	2.3	1.8	1.65	2.9	2.45	3.4	3.2	3.1	4.2	5.4	5.0	2.2
16.....	2.45	1.8	1.6	2.8	2.4	4.7	3.4	3.6	4.2	4.1	4.7	3.1
17.....	2.25	1.6	1.5	2.7	2.35	4.4	3.2	3.4	4.6	6.4	4.6	3.1
18.....	2.2	1.5	1.5	2.6	2.7	4.0	3.2	3.2	5.2	6.2	5.1	3.0
19.....	2.2	1.35	1.7	2.45	3.3	3.6	3.2	2.8	5.8	5.5	4.8	2.8
20.....	2.2	1.25	1.85	2.4	3.5	3.3	3.1	2.45	5.2	5.2	4.4	2.5
21.....	2.2	1.2	2.25	2.3	3.3	3.3	2.9	2.45	4.8	4.7	4.3	2.5
22.....	2.0	1.15	2.8	2.3	3.1	3.3	2.9	2.4	4.7	4.6	5.5	2.6
23.....	1.95	1.1	2.6	2.8	2.9	4.8	2.9	2.6	4.5	4.3	4.6	2.4
24.....	1.8	1.1	2.4	2.7	2.8	5.6	3.9	2.6	4.3	4.1	4.9	2.2
25.....	1.7	1.1	2.2	2.5	2.8	5.9	4.7	2.6	4.1	4.1	4.6	2.1
26.....	1.6	1.1	2.2	2.5	2.7	6.1	4.2	2.8	3.9	4.1	4.4	2.3
27.....	1.6	1.2	4.2	2.6	2.6	5.2	4.1	2.9	3.7	3.9	4.1	2.3
28.....	1.5	1.1	4.4	2.6	2.5	4.7	3.8	2.8	4.5	3.8	3.9	2.5
29.....	1.5	1.2	3.7	2.6	2.6	4.4	3.6	....	5.1	3.8	3.6	2.5
30.....	1.5	1.2	3.2	2.6	2.7	4.3	3.5	....	4.6	3.8	3.4	2.45
31.....	1.7	1.2	....	3.0	....	3.9	3.4	....	4.6	....	3.2	.....

Daily discharge, in second-feet, of DELAWARE RIVER AT PORT JERVIS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	2,070	780	830	2,920	7,810	2,470	5,680	3,650	7,060	7,430	4,750	3,400
2.....	1,720	880	880	2,690	6,350	2,070	7,430	3,910	16,200	6,350	5,360	2,920
3.....	2,070	780	1,110	2,470	5,050	1,980	12,600	2,470	11,600	6,010	7,060	2,690
4.....	1,890	732	935	2,690	4,460	1,980	10,300	2,260	9,010	5,680	6,010	2,470
5.....	1,640	780	780	2,920	3,400	1,980	7,430	2,690	7,810	7,430	5,050	2,260
6.....	1,240	685	780	3,160	4,460	1,800	5,360	2,690	7,810	8,200	4,750	2,070
7.....	1,240	642	685	13,100	3,910	1,720	5,680	2,260	7,810	8,600	4,460	2,470
8.....	1,390	685	642	8,600	3,910	1,640	6,700	1,890	6,700	8,600	4,460	2,470
9.....	1,550	685	600	6,010	2,920	1,890	6,700	1,890	7,810	9,420	4,460	2,470
10.....	1,390	732	525	4,750	2,690	2,070	5,680	1,720	20,500	9,010	7,060	2,070
11.....	1,390	732	490	4,180	2,470	1,800	4,180	1,550	15,100	7,810	15,700	1,980
12.....	1,470	685	490	3,910	2,470	1,800	3,910	1,550	12,100	16,200	14,600	1,890
13.....	1,470	780	490	3,650	2,260	2,260	3,400	1,550	10,300	19,200	13,100	1,720
14.....	1,550	780	562	3,400	2,070	2,690	3,400	1,980	8,200	14,100	12,100	1,550
15.....	1,720	990	830	2,920	1,980	4,180	3,650	3,400	6,700	11,600	9,840	1,550
16.....	1,980	990	780	2,690	1,890	8,600	4,180	4,750	6,700	6,350	8,600	3,400
17.....	1,640	780	685	2,470	1,800	7,430	3,650	4,180	8,200	16,800	8,200	3,400
18.....	1,550	685	685	2,260	2,470	6,010	3,650	3,650	10,700	15,700	10,300	3,160
19.....	1,550	562	880	1,980	3,910	4,750	3,650	2,690	13,600	12,100	9,010	2,690
20.....	1,550	490	1,050	1,890	4,460	3,910	3,400	1,980	10,700	10,700	7,430	2,070
21.....	1,550	455	1,640	1,720	3,910	3,910	2,920	1,980	9,010	8,600	7,060	2,070
22.....	1,240	422	2,690	1,720	3,400	3,910	2,920	1,890	8,600	8,200	12,100	2,260
23.....	1,180	390	2,260	2,690	2,920	9,010	2,920	2,260	7,810	7,060	8,200	1,890
24.....	990	390	1,890	2,470	2,690	12,600	5,680	2,260	7,060	6,350	9,420	1,550
25.....	880	390	1,550	2,070	2,690	14,100	8,600	2,260	6,350	6,350	8,200	1,390
26.....	780	390	1,550	2,070	2,470	15,100	6,700	2,690	5,680	6,350	7,430	1,720
27.....	780	455	6,700	2,260	2,260	10,700	6,350	2,920	5,050	5,680	6,350	1,720
28.....	685	390	7,430	2,260	2,070	8,600	5,360	2,690	7,810	5,360	5,680	2,070
29.....	685	455	5,050	2,260	2,260	7,430	4,750	......	10,300	5,360	4,750	2,070
30.....	685	455	3,650	2,260	2,470	7,060	4,460	......	8,200	5,360	4,180	1,980
31.....	880	455	......	3,160	......	5,680	4,180	......	8,200	......	3,650	......
Mean...	1,370	629	1,640	3,340	3,260	5,200	5,340	2,560	9,310	9,070	7,720	2,250

Monthly discharge of DELAWARE RIVER AT PORT JERVIS, for the year ended June 30, 1919

[Drainage area, 3,250 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July........................	2,070	685	1,370	0.422	0.49
August........................	990	390	629	0.194	0.22
September........................	7,430	490	1,640	0.505	0.56
October........................	13,100	1,720	3,340	1.03	1.19
November........................	7,810	1,800	3,260	1.00	1.12
December........................	15,100	1,640	5,200	1.60	1.84
January........................	12,600	2,920	5,340	1.64	1.89
February........................	4,750	1,550	2,560	0.788	0.82
March........................	20,500	5,050	9,310	2.86	3.30
April........................	19,200	5,360	9,070	2.79	3.11
May........................	15,700	3,650	7,720	2.38	2.74
June........................	3,400	1,390	2,250	0.692	0.77
The year........................	20,500	390	4,807	1.33	18.05

BEAVER KILL

BEAVER KILL AT COOKS FALLS

Location.— At the covered highway bridge in Cooks Falls, Delaware county.

Drainage area.— 236 square miles. (Measured on post-route and U. S. Geological Survey topographic maps.)

Records available.— July 25, 1913, to June 30, 1919.

Gage.— Vertical staff in two sections bolted to rock on left bank under the bridge; read by H. B. Couch.

Discharge measurements.— Made from the bridge or by wading a short distance downstream.

Channel and control.— Coarse gravel, boulders and solid ledge; practically permanent.

Extremes of discharge.— Current year: Maximum stage, 7.5 feet at 11 A. M., on July 22. Minimum stage recorded, 0.84 foot at 7 A. M. and 3 P. M., August 24.

1913–1919: Maximum stage recorded, 12.4 feet at 5 P. M., October 30, 1917; discharge, about 9,700 second-feet. Minimum stage recorded, 0.70 foot from 7 A. M., October 12, to 7 A. M., October 13, 1916; discharge, 30 second-feet.

Ice.— Stage-discharge relation somewhat affected by ice.

Accuracy.— Stage-discharge relation practically permanent; usually affected by ice during portions of the period December to March, inclusive. Rating curve well defined between 50 and 4,500 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good for periods when the stage-discharge relation was not affected by ice; fair for other periods.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of BEAVER KILL AT COOKS FALLS, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Aug. 15........	E. D. Burchard....................................	1.39	129
Aug. 15........	E. D. Burchard....................................	1.39	128
1919			
Mar. 15 *a*	J. W. Moulton....................................	2.88	522
May 9........	J. W. Moulton....................................	2.73	458

a Anchor ice running.

Daily gage height in feet, of BEAVER KILL AT COOKS FALLS, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	1.7	1.11	1.9	1.95	3.4	2.15	3.1	2.1	6.6	3.2	2.9	*a*
2.....	1.7	1.06	1.39	1.9	3.0	2.0	5.1	2.1	4.0	3.0	3.9	2.15
3.....	1.55	1.02	1.11	2.5	2.9	2.0	4.0	2.1	3.3	3.1	3.4	2.1
4.....	1.6	1.00	1.03	2.15	2.7	2.0	4.0	2.25	3.2	3.4	*a*	2.05
5.....	1.55	1.16	0.98	2.05	2.7	1.95	3.6	2.1	3.5	3.6	3.0	1.95
6.....	1.46	1.09	0.96	2.9	2.6	1.8	3.3	2.05	3.7	4.6	2.9	2.0
7.....	1.46	1.01	0.98	3.2	2.45	1.65	3.1	2.0	3.6	4.0	2.8	2.05
8.....	1.46	0.98	0.96	2.7	2.35	1.8	3.2	1.95	3.2	3.9	2.7	*a*
9.....	1.44	0.98	0.96	2.4	2.25	2.0	3.0	1.9	5.5	3.8	2.8	1.9
10.....	1.55	0.98	0.92	2.25	2.2	1.85	2.9	1.85	5.0	3.6	4.1	1.8
11.....	1.6	1.37	0.94	2.15	2.15	1.9	2.7	1.65	4.2	3.9	4.4	1.7
12.....	1.55	1.33	0.94	2.1	2.1	2.0	2.7	1.8	3.7	6.0	4.0	1.65
13.....	1.65	1.23	1.08	2.1	2.05	1.9	2.45	1.85	3.4	4.3	3.9	1.6
14.....	1.95	1.09	0.97	2.1	2.0	2.0	2.35	2.0	3.3	4.2	3.5	1.55
15.....	2.15	1.38	0.93	2.0	1.95	4.1	2.5	2.3	2.9	3.9	3.4	*a*
16.....	1.65	1.17	0.92	1.95	1.6	4.0	2.45	1.95	2.9	4.6	3.3	3.0
17.....	1.55	1.07	0.90	1.9	1.42	3.4	2.4	1.8	3.0	5.6	3.8	2.35
18.....	1.55	1.00	0.95	1.85	2.25	3.1	2.4	1.9	4.6	4.6	3.8	2.0
19.....	1.44	0.98	1.39	1.85	2.6	2.8	2.4	1.55	4.0	4.2	3.6	1.8
20.....	1.38	0.95	1.28	1.8	2.45	2.6	2.05	1.6	3.6	3.8	3.3	1.8
21.....	1.32	0.90	2.15	3.8	2.3	2.4	2.0	1.8	3.6	3.6	3.4	1.9
22.....	1.29	0.88	1.6	2.6	2.25	2.6	3.0	1.8	3.5	3.4	3.4	*a*
23.....	1.25	0.86	1.43	2.4	2.1	6.2	2.0	1.7	3.4	3.2	3.9	1.55
24.....	1.22	0.84	1.35	2.25	2.1	4.4	4.0	1.7	3.3	3.1	3.4	1.5
25.....	1.21	1.34	1.29	2.15	2.05	6.0	3.1	1.55	3.1	3.1	3.2	1.48
26.....	1.19	1.01	2.8	2.2	2.05	4.8	3.0	2.2	3.0	3.5	3.1	1.49
27.....	1.16	0.92	3.6	2.3	2.0	4.2	2.7	1.8	3.0	3.1	2.9	2.4
28.....	1.12	0.88	2.7	2.25	2.0	3.8	2.5	1.8	5.0	3.1	2.7	2.3
29.....	1.14	1.06	2.2	2.2	2.4	3.4	2.45	......	4.1	3.0	2.7	*a*
30.....	1.13	1.01	2.0	2.4	2.3	3.2	2.4	......	3.8	2.9	2.5	1.65
31.....	1.18	0.86	......	4.0	......	3.0	2.3	......	3.4	......	2.35	......

a No record.

Daily discharge, in second-feet, of BEAVER KILL AT COOKS FALLS, for the year ended June 30, 1918

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	755	232	805	186	1,730	371	200	130	......	1,240	750	415
2	1,200	232	530	186	1,400	355	190	130	......	1,690	660	330
3	910	256	455	175	1,080	355	190	120	......	1,690	570	287
4	615	244	455	244	805	325	190	120	......	1,830	530	261
5	530	232	371	269	705	310	190	120	......	1,180	490	261
6	455	232	296	208	615	282	190	110	......	950	450	236
7	387	220	256	186	282	256	200	110	......	850	415	315
8	355	232	256	175	404	244	190	110	......	750	330	287
9	660	660	256	220	325	232	190	110	805	1,300	315	224
10	2,720	455	269	164	310	220	200	110	830	1,360	315	224
11	3,310	387	256	154	296	200	200	......	805	1,180	315	200
12	2,960	244	232	310	282	200	200	......	755	1,000	301	315
13	1,870	208	208	244	296	200	200	......	855	850	315	301
14	805	186	186	340	296	200	200	......	1,020	950	490	248
15	615	175	175	355	296	200	200	......	755	1,240	615	224
16	530	910	164	310	269	190	200	......	705	1,300	450	189
17	530	1,140	164	256	282	200	200	......	855	1,120	415	178
18	530	530	144	232	325	200	200	......	1,260	1,830	380	167
19	530	355	134	232	310	200	200	......	1,730	1,300	345	167
20	455	310	124	530	296	200	190	......	2,240	1,000	345	146
21	420	282	114	490	282	200	180	......	2,720	1,690	380	136
22	340	387	114	325	404	200	180	......	3,310	2,590	345	800
23	855	2,320	124	282	1,140	190	170	......	2,960	1,620	345	362
24	660	1,080	114	530	615	186	170	......	2,160	1,300	315	287
25	490	755	124	910	371	197	170	......	1,940	1,060	301	224
26	420	455	114	570	355	197	160	......	1,660	850	415	200
27	282	282	114	1,590	340	208	160	......	1,400	750	380	167
28	256	1,520	164	1,260	325	197	160	......	1,020	660	345	156
29	340	2,880	144	1,940	340	200	150	......	910	660	287	156
30	310	910	186	7,110	387	200	140	......	1,260	750	415	146
31	256	1,080	......	2,400	......	200	130	......	1,260	......	490	......
Mean	818	626	235	722	505	230	184	417	1,420	1,220	414	250

NOTE.— Discharge, December 11 to 23 and December 29 to February 10, estimated, because of ice, from discharge measurements, weather records, study of gage-height graph and comparison with similar studies for East branch of Delaware river at Fish Eddy. Mean discharge, February 11 to 28, inclusive, estimated, 584 second-feet. Mean discharge, March 1 to 8, inclusive, estimated, 1,370 second-feet. April 1 to September 30, data revised and supersede data previously published.

Monthly discharge or BEAVER KILL AT COOKS FALLS, for the year ended June 30, 1918

[Drainage area, 236 square miles]

Month	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	3,310	256	818	3.47	4.00
August	2,880	175	626	2.65	3.06
September	805	114	235	0.996	1.11
October	7,110	154	722	3.06	3.53
November	1,730	269	505	2.14	2.39
December	371	176	230	0.975	1.12
January	200	130	184	0.780	0.90
February	....	....	417	1.77	1.84
March	3,310	705	1,420	6.02	6.94
April	2,590	660	1,220	5.17	5.77
May	750	287	414	1.75	2.02
June	800	136	250	1.06	1.18
The year	7,110	114	587	2.49	33.86

NOTE.— Estimates revised, April 1 to June 30, on basis of additional measurements and supersede data previously published.

Daily discharge, in second-feet, of BEAVER KILL AT COOKS FALLS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	167	68	212	224	750	274	615	261	2,910	660	530	300
2.....	167	64	106	212	570	236	1,760	261	1,060	570	1,000	274
3.....	136	61	68	380	530	236	1,060	261	705	615	750	261
4.....	146	59	61	274	450	236	1,060	301	660	750	650	248
5.....	136	74	58	248	450	224	850	261	800	850	570	224
6.....	119	66	57	530	415	189	705	248	900	1,420	530	236
7.....	119	60	58	660	362	156	615	236	850	1,060	490	248
8.....	119	58	57	450	330	189	660	224	660	1,000	450	230
9.....	115	58	57	345	301	236	570	212	2,040	950	490	212
10.....	136	58	55	301	287	200	530	200	1,690	850	1,120	189
11.....	146	103	56	274	274	212	450	156	1,180	1,000	1,300	167
12.....	136	97	56	261	261	236	450	189	900	2,430	1,060	156
13.....	156	82	65	261	248	212	362	200	750	1,240	1,000	146
14.....	224	66	58	261	236	236	330	236	705	1,180	800	136
15.....	274	105	56	236	224	1,120	380	315	530	1,000	750	400
16.....	156	75	55	224	146	1,060	362	224	530	1,420	705	570
17.....	136	65	54	212	112	750	345	189	570	2,110	950	330
18.....	136	59	56	200	301	615	345	212	1,420	1,420	950	236
19.....	115	58	106	200	415	490	345	136	1,060	1,180	850	189
20.....	105	56	89	189	362	415	248	146	850	950	705	189
21.....	95	54	274	950	315	345	236	189	850	850	750	212
22.....	91	53	146	415	301	415	570	189	800	750	750	200
23.....	85	53	114	345	261	2,590	236	167	750	660	1,000	136
24.....	81	52	100	301	261	1,300	1,060	167	705	615	750	126
25.....	79	98	91	274	248	2,430	615	136	615	615	660	122
26.....	77	60	490	287	248	1,550	570	287	570	800	615	124
27.....	74	55	850	315	236	1,180	450	189	570	615	530	345
28.....	69	53	450	301	236	950	380	189	1,690	615	450	315
29.....	71	64	287	287	345	750	362	......	1,120	570	450	285
30.....	70	60	236	345	315	660	345	......	950	530	380	156
31.....	76	53	......	1,060	......	570	315	......	750	......	330	......
Mean...	123	66	149	349	326	654	554	214	972	976	720	232

Monthly discharge of BEAVER KILL AT COOKS FALLS, for the year ended June 30, 1919

[Drainage area, 236 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July..............................	274	69	123	0.521	0.60
August..............................	105	52	66	0.280	0.32
September..............................	850	54	149	0.631	0.70
October..............................	1,060	189	349	1.48	1.71
November..............................	750	112	326	1.38	1.54
December..............................	2,590	156	654	2.77	3.19
January..............................	1,760	236	554	2.35	2.71
February..............................	315	136	214	0.911	0.95
March..............................	2,910	530	972	4.12	4.75
April..............................	2,430	530	976	4.14	4.62
May..............................	1,300	330	720	3.05	3.52
June..............................	570	122	232	0.983	1.10
The year..............................	2,910	52	445	1.89	25.71

WEST BRANCH, DELAWARE RIVER

A brief description of the West branch, Delaware river, will be found in the description of the Delaware river.

WEST BRANCH OF DELAWARE RIVER AT HALE EDDY

Location.—At the highway bridge in the village of Hale Eddy, Delaware county, 8 miles below the power dam of the Deposit Electric Co., and 8½ miles above junction with the East branch of Delaware river.

Drainage area.— 611 square miles. (Measured on post-route map.)

Records available.—November 15, 1912, to June 30, 1919. Records were obtained at Hancock, about 7 miles below, from October 15, 1902, to December 31, 1912.

Gage.— Vertical staff in four sections, attached to rocks near the right abutment of the bridge and to the abutment; read by W. J. Shanly.

Discharge measurements.— Made from the cable installed in July, 1916, about 400 feet below the gage. Previous measurements made from the highway bridge or by wading.

Channel and control.— Coarse gravel and boulders; practically permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 7.5 feet at 4 P. M., April 12; discharge, 5,420 second-feet. Minimum stage recorded, 1.5 feet several times in August; discharge, 65 second-feet.

1913–1919: Maximum stage recorded, *15.3 feet at 5 P. M., March 27, 1913; discharge, about 25,000 second-feet. Minimum stage recorded, 1.0 foot at 6 P. M., September 21, 1913; discharge, 34 second-feet.

Ice.— Stage-discharge relation affected by ice.

Accuracy.—Stage-discharge relation practically permanent. Rating curve well defined between 300 and 18,000 second-feet. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table.

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* The observer states that on October 10, 1893, the water rose to elevation indicated by a nail in a tree near the gage. The nail is at gage height 20.3 feet. No data available indicating whether the present rating is applicable to this gage height.

Results good during periods when the stage-discharge relation is not affected by ice. Results good for other periods.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of WEST BRANCH OF DELAWARE RIVER AT HALE EDDY, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Aug. 14	E. D. Burchard	1.62	94
Aug. 14	E. D. Burchard	1.61	92.5
Oct. 12	C. C. Covert	3.65	1,010
Dec. 24	C. C. Covert	4.44	1,550
1919			
Jan. 22 *a*	C. C. Covert	2.94	560
May 8	J. W. Moulton	3.57	855
June 27	C. C. Covert	2.14	230

a Some shore ice.

Daily gage height, in feet, of WEST BRANCH OF DELAWARE RIVER AT HALE EDDY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	2.55	1.88	1.68	3.7	5.4	2.7	3.9	3.15	6.2	4.2	3.6	2.75
2	2.9	1.85	1.80	3.45	4.8	2.6	6.0	3.05	5.2	4.0	3.6	2.65
3	3.1	1.75	2.15	3.9	4.8	2.75	5.6	2.95	4.6	4.0	3.6	2.55
4	2.75	1.75	2.15	3.7	4.6	2.8	5.0	3.05	4.3	4.8	3.6	2.5
5	2.65	1.72	1.95	3.8	4.2	2.65	4.5	3.2	4.2	4.8	3.6	2.4
6	2.6	1.62	2.2	7.1	3.8	2.5	4.2	3.05	4.4	5.0	3.6	2.35
7	2.65	1.60	2.25	6.2	3.8	2.6	3.9	2.85	4.2	5.1	3.45	2.25
8	2.6	1.52	2.1	5.0	3.6	2.65	3.5	2.7	4.0	4.8	3.5	2.3
9	2.45	1.60	2.05	4.6	3.6	2.85	3.35	2.65	4.9	4.8	3.45	2.25
10	2.35	1.70	1.90	4.4	3.5	2.85	3.2	2.55	6.0	5.0	4.6	2.2
11	2.45	1.95	1.95	4.0	3.45	2.65	3.1	2.35	5.4	5.0	6.1	1.95
12	2.55	1.75	1.88	3.7	3.35	3.0	3.05	2.35	4.8	7.4	5.8	1.75
13	2.55	1.70	1.92	3.8	3.2	2.85	3.05	2.55	4.5	6.6	6.0	1.75
14	2.7	1.60	1.85	3.6	2.95	3.4	3.3	2.95	4.2	6.0	5.6	1.70
15	2.85	1.65	1.88	3.45	2.8	4.4	3.5	4.0	4.0	5.4	5.0	2.05
16	2.8	1.80	1.75	3.15	2.8	4.5	3.25	3.6	4.0	5.0	4.6	2.05
17	2.65	1.85	1.80	3.05	2.75	4.0	3.3	3.0	4.6	5.6	4.6	2.2
18	2.7	1.80	2.1	3.0	4.0	3.9	3.25	2.85	5.3	5.0	4.6	2.35
19	2.7	1.75	2.2	2.85	3.9	3.8	3.15	2.75	5.0	4.8	4.1	2.15
20	2.6	1.72	2.3	2.85	3.8	3.6	3.15	2.65	4.8	4.4	3.8	2.15
21	2.55	1.70	3.2	2.8	3.6	3.6	3.05	2.8	4.6	4.2	3.8	2.25
22	2.45	1.72	3.3	2.8	3.6	3.6	2.9	2.65	4.4	4.0	3.7	2.05
23	2.4	1.62	3.2	2.95	3.45	4.9	2.95	2.7	4.2	3.8	4.1	1.75
24	2.3	1.52	3.4	2.9	3.3	4.4	4.8	2.65	4.0	3.8	3.9	1.75
25	2.2	1.52	4.0	2.9	3.2	5.3	4.4	2.65	3.8	3.8	3.8	1.75
26	2.15	1.55	5.2	2.9	3.15	5.0	4.2	3.05	3.8	3.8	3.7	2.0
27	1.95	1.58	5.4	3.0	3.05	4.8	4.0	2.9	3.8	3.8	3.45	2.1
28	1.68	1.58	5.1	2.95	2.9	4.5	3.8	2.95	3.8	3.8	3.35	2.1
29	1.65	1.65	4.9	2.95	2.9	4.2	3.7	......	4.5	3.6	3.15	2.0
30	1.75	1.70	4.1	3.1	2.8	4.0	3.6	......	4.6	3.6	3.05	1.95
31	2.2	1.65	......	5.9	......	3.8	3.3	......	4.5	......	2.95	......

Daily discharge, in second-feet, of WEST BRANCH OF DELAWARE RIVER AT HALE EDDY, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	388	150	101	1,040	2,560	455	1,180	690	3,540	1,420	970	480
2	555	142	130	870	1,940	410	3,280	632	2,340	1,260	970	432
3	660	118	232	1,180	1,940	480	2,790	580	1,760	1,260	970	388
4	480	118	232	1,040	1,760	505	2,140	632	1,500	1,940	970	365
5	432	110	170	1,110	1,420	432	1,670	720	1,420	1,940	970	325
6	410	89	250	4,810	1,110	365	1,420	632	1,580	2,140	970	305
7	432	85	268	3,540	1,110	410	1,180	530	1,420	2,240	870	268
8	410	69	215	2,140	970	432	900	455	1,260	1,940	900	285
9	345	85	200	1,760	970	530	810	432	2,040	1,940	870	268
10	305	105	155	1,580	900	530	720	388	3,280	2,140	1,760	250
11	345	170	170	1,260	870	432	660	305	2,560	2,140	3,410	170
12	388	118	150	1,040	810	605	632	305	1,940	5,260	3,030	118
13	388	105	161	1,110	720	530	632	388	1,670	4,080	3,280	118
14	455	85	142	970	580	840	780	580	1,420	3,280	2,790	105
15	530	95	150	870	505	1,580	900	1,260	1,260	2,560	2,140	200
16	505	130	118	690	505	1,670	750	970	1,260	2,140	1,760	200
17	432	142	130	632	480	1,260	780	605	1,760	2,790	1,760	250
18	455	130	215	605	1,260	1,180	750	530	2,450	2,140	1,760	305
19	455	118	250	530	1,180	1,110	690	480	2,140	1,940	1,340	232
20	410	110	285	530	1,110	970	690	432	1,940	1,580	1,110	232
21	388	105	720	505	970	970	632	505	1,760	1,420	1,110	268
22	345	110	780	505	970	970	555	432	1,580	1,260	1,040	200
23	325	89	720	580	870	2,040	580	455	1,420	1,110	1,340	118
24	285	69	840	555	780	1,580	1,940	432	1,260	1,110	1,180	118
25	250	69	1,260	555	720	2,450	1,580	432	1,110	1,110	1,110	118
26	232	75	2,340	655	690	2,140	1,420	632	1,110	1,110	1,040	185
27	170	81	2,560	605	632	1,940	1,260	555	1,110	1,110	870	215
28	101	81	2,240	580	555	1,670	1,110	580	1,110	1,110	810	215
29	95	95	2,040	580	555	1,420	1,040	......	1,670	970	690	185
30	118	105	1,340	660	505	1,260	970	......	1,760	970	632	170
31	250	95	......	3,150	......	1,110	780	......	1,670	......	580	......
Mean	366	105	619	1,170	998	1,040	1,140	556	1,750	1,910	1,390	236

NOTE.—Stage-discharge relation not affected by ice.

Monthly discharge of WEST BRANCH OF DELAWARE RIVER AT HALE EDDY, for the year ended June 30, 1919

[Drainage area, 611 square miles]

Month	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	660	95	366	0.599	0.69
August	170	69	105	0.172	0.20
September	2,560	101	619	1.01	1.13
October	4,810	505	1,170	1.92	2.21
November	2,560	480	998	1.63	1.82
December	2,450	365	1,040	1.70	1.96
January	3,280	555	1,140	1.87	2.16
February	1,260	305	556	0.910	0.95
March	3,540	1,110	1,750	2.86	3.30
April	5,260	970	1,910	3.13	3.49
May	3,410	580	1,390	2.27	2.62
June	480	105	236	0.386	0.43
The year	5,260	69	940	1.54	20.96

SUSQUEHANNA RIVER DRAINAGE BASIN

DESCRIPTION

Susquehanna river rises in Otsego lake, in northern Otsego county, at an elevation of 1,193 feet above tide, and flows in a general southerly direction into Chesapeake bay. Its course is in many places extremely tortuous, crossing the State boundary between New York and Pennsylvania three times. The entire length of the river is about 500 miles and it drains an area of 27,400 square miles, of which 21,060 square miles lie in Pennsylvania, 6,080 in New York and 260 in Maryland.

Three important streams contribute to the flow in New York state — Unadilla, Chenango and Chemung rivers. These streams all enter from the north. Unadilla, the smallest, joins the main stream near Sidney, Chenango at Binghamton and Chemung at a point in Pennsylvania about 8 miles below the state line.

The topography of the basin varies widely in character. In New York the stream and its tributaries flow through a rolling and, in places, rather broken country, bounded on the north by a mountainous area. In this part of its course its bed is of gravel or sand, with rock ledges here and there, and its banks are moderately high and not extensively subject to overflow. In Pennsylvania the river enters a mountain region, its banks are high and it winds and twists among the parallel ranges in a bed composed generally of drift materials, gravels, sand and boulders. In the lower part of its course, from Marietta, Pa., to Havre de Grace, Md., it occupies a broad, deep valley, ranging in width from a few hundred feet to more than a mile, and is for the most part bounded on either shore by rocky bluffs and table-lands elevated from 100 to 500 feet above its waters.

SUSQUEHANNA RIVER

SUSQUEHANNA RIVER AT CONKLIN

Location.— At steel highway bridge, just below Conklin, Broome county, 5 miles below Big Snake creek and 8 miles above Chenango river.

Drainage area.— 2,350 square miles.

Records available.— November 13, 1912, to June 30, 1919. Records were obtained at Binghamton, 8 miles below, from July 31, 1901, to December 31, 1912.

Gage.— Gurley 7-day water-stage recorder on left bank, just below the highway bridge. Prior to January 21, 1919, a Stevens water-stage recorder operated here. Stevens gage removed because of necessary repairs.

Discharge measurements.— Made from the bridge or by wading.

Channel and control.— Coarse gravel and boulders; probably permanent.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 10.65 feet at 3 P. M., October 31; discharge, 17,900 second-feet. Minimum stage, from water-stage recorder, 2.43 feet from 1 to 2 A. M., August 9; discharge, 488 second-feet.

1912–1919: Maximum stage recorded, 19.74 feet at the former station in Binghamton at 7:40 A. M., March 2, 1902; discharge, about 62,500 second-feet. Minimum stage recorded, 1.32 feet at 8:20 A. M. and 4 P. M., September 16, 1913; discharge, 106 second-feet.

Ice.— Stage-discharge relation affected by ice.

Accuracy.— Stage-discharge relation practically permanent. Usually affected by ice for a large portion of the period from January to March, inclusive. Rating curve well defined between 250 and 55,000 second-feet. Operation of the water-stage recorder fairly satisfactory. Daily discharge ascertained by applying mean daily gage height to rating table, except for days when the mean gage height would not give the discharge within 1 per cent; for such days the discharge is the mean of 24 hourly determinations. Gage heights obtained by inspecting gage-height graph or by taking mean of two observations per day. Records good except for periods when the stage-discharge relation was affected by ice, for which they are fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of SUSQUEHANNA RIVER AT CONKLIN, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Aug. 16	E. D. Burchard	2.73	672
1919			
Jan. 21	E. D. Burchard	4.32	2,390
May 7	J. W. Moulton	5.30	3,990

Daily gage height, in feet, of SUSQUEHANNA RIVER AT CONKLIN, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	3.7	2.61	*a*	4.6	9.4	3.85	5.1	4.4	*a*	5.6	5.05	3.9
2	4.05	2.56	*a*	4.55	*a*	3.85	6.4	4.3	7.5	5.3	5.0	3.75
3	4.4	2.54	3.5	4.9	6.4	3.95	8.0	4.3	6.7	5.25	5.0	3.6
4	3.95	2.49	3.11	4.85	5.95	*a*	7.2	4.25	5.8	5.9	5.05	3.5
5	3.8	2.47	2.85	4.55	5.75	*a*	6.2	4.2	5.6	6.6	4.8	3.39
6	3.65	2.50	2.99	*a*	5.6	*a*	5.6	4.15	6.0	6.8	5.35	3.33
7	3.48	2.47	2.92	7.7	5.3	*a*	5.2	4.1	5.8	6.7	5.3	3.25
8	3.35	2.46	2.74	*a*	5.05	*a*	5.4	3.85	5.3	6.7	5.2	3.12
9	3.25	2.43	2.76	5.45	4.85	*a*	5.3	3.65	*a*	6.9	5.3	3.10
10	3.30	2.45	2.66	5.0	4.75	*a*	5.0	3.7	7.3	6.8	*a*	3.09
11	3.45	2.50	2.60	4.7	4.6	*a*	4.5	3.6	7.6	7.0	8.5	3.09
12	3.95	2.50	2.52	4.5	4.55	*a*	4.9	3.6	6.7	8.6	8.7	3.1[illegible]
13	4.3	2.65	*a*	4.35	4.4	*a*	4.9	3.45	6.05	8.8	8.6	3.01
14	4.0	2.78	2.79	4.25	4.3	*a*	4.7	3.55	5.75	7.8	7.9	2.95
15	3.85	2.84	2.70	4.15	4.2	*a*	5.0	*a*	5.25	7.1	7.0	2.95
16	3.95	2.73	2.71	4.05	4.1	*a*	5.4	5.1	5.5	6.8	6.4	3.05
17	3.75	2.69	2.76	3.9	4.0	*a*	4.9	*a*	*a*	7.0	6.1	*a*
18	3.6	2.54	2.91	3.8	*a*	*a*	4.9	4.15	7.6	7.0	6.1	3.5
19	3.85	2.50	3.03	3.7	6.7	*a*	4.6	4.1	7.4	6.5	6.0	3.21
20	3.7	2.50	*a*	3.6	6.2	*a*	4.9	3.95	6.7	6.0	5.5	3.07
21	3.42	2.50	4.45	3.8	5.6	*a*	4.7	3.8	6.2	5.7	*a*	3.20
22	3.35	2.50	4.35	4.0	5.25	*a*	4.35	3.6	6.1	5.45	*a*	*a*
23	3.20	2.50	4.0	3.9	5.0	6.05	4.35	3.55	5.85	5.2	*a*	3.5
24	3.14	2.50	3.7	3.7	4.8	6.0	*a*	3.6	5.5	5.0	*a*	3.15
25	3.18	2.50	3.55	3.6	4.6	*a*	6.2	3.7	5.3	5.15	5.45	2.96
26	3.00	2.50	*a*	3.55	4.45	*a*	5.65	4.05	5.1	5.3	5.3	2.82
27	2.89	2.50	6.7	3.5	4.35	*a*	5.25	4.2	5.0	5.15	5.0	2.77
28	2.78	2.50	6.4	3.65	4.2	*a*	5.05	4.0	5.9	5.1	4.65	*a*
29	2.68	2.50	5.6	3.6	4.2	5.6	4.85	......	6.3	5.15	4.35	*a*
30	2.69	2.50	4.85	*a*	4.2	5.1	4.7	......	5.55	5.2	4.15	*a*
31	2.69	2.50	......	*a*	......	5.0	4.6	......	5.55	......	4.0	......

a No record.

Daily discharge, in second-feet, of SUSQUEHANNA RIVER AT CONKLIN, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	1,570	607	800	2,830	14,000	1,750	3,680	2,510	4,360	4,640	3,590	1,810
2	2,000	572	1,800	2,750	9,360	1,750	6,400	2,360	9,000	4,040	3,500	1,630
3	2,510	558	1,350	3,330	6,400	1,880	10,200	2,360	7,100	3,950	3,500	1,460
4	1,880	524	979	3,240	5,380	1,900	8,280	2,280	5,060	5,280	3,590	1,350
5	1,690	512	775	2,750	4,950	2,200	5,940	2,210	4,640	6,860	3,160	1,240
6	1,520	530	882	8,380	4,640	2,200	4,640	2,140	5,500	7,330	4,140	1,180
7	1,330	512	826	9,500	4,040	2,200	3,860	2,070	5,060	7,100	4,040	1,100
8	1,200	506	698	5,980	3,590	2,200	4,230	1,750	4,040	7,100	3,860	988
9	1,100	488	712	4,330	3,240	2,200	4,040	1,520	5,050	7,560	4,040	970
10	1,150	500	642	3,500	3,080	2,400	3,500	1,570	8,520	7,330	6,790	962
11	1,300	530	600	2,990	2,830	2,800	2,670	1,460	9,240	7,800	11,500	962
12	1,880	530	544	2,670	2,750	4,000	3,330	1,460	7,100	11,800	12,100	988
13	2,360	635	680	2,440	2,510	5,500	3,330	1,300	5,600	12,300	11,800	898
14	1,940	726	783	2,280	2,360	7,000	2,990	1,400	4,950	9,740	10,000	850
15	1,750	768	670	2,140	2,210	8,000	3,500	2,060	3,950	8,040	7,800	850
16	1,880	691	677	2,000	2,070	7,000	4,230	3,680	4,430	7,330	6,400	930
17	1,630	663	712	1,810	1,940	6,000	3,330	2,990	6,730	7,800	5,720	1,040
18	1,460	558	818	1,690	5,340	5,000	3,330	2,140	9,240	7,800	5,720	1,350
19	1,750	530	914	1,570	7,100	4,000	2,830	2,070	8,760	6,630	5,500	1,070
20	1,570	530	1,300	1,460	5,940	3,400	3,330	1,880	7,100	5,500	4,430	946
21	1,270	530	2,590	1,690	4,640	3,400	2,990	1,690	5,940	4,840	3,800	1,060
22	1,200	530	2,440	1,940	3,950	6,000	2,440	1,460	5,720	4,330	4,000	1,160
23	1,060	530	1,940	1,810	3,500	5,600	2,440	1,400	5,170	3,860	5,000	1,350
24	1,010	530	1,570	1,570	3,160	5,500	4,500	1,460	4,430	3,500	5,900	1,020
25	997	530	1,400	1,460	2,830	6,000	5,940	1,570	4,040	3,770	4,330	858
26	890	530	3,930	1,400	2,590	6,000	4,740	2,000	3,680	4,040	4,040	754
27	803	530	7,100	1,350	2,440	5,500	3,950	2,210	3,500	3,770	3,500	719
28	726	530	6,400	1,520	2,210	5,000	3,590	1,940	5,280	3,680	2,910	750
29	656	530	4,640	1,460	2,210	4,640	3,240	......	6,170	3,770	2,440	800
30	663	530	3,240	2,170	2,210	3,680	2,990	......	4,530	3,860	2,140	750
31	663	530	......	15,100	......	3,500	2,830	......	4,530	......	1,940	......
Mean	1,400	558	1,750	3,200	4,120	4,140	4,110	1,960	5,760	6,180	5,200	1,060

NOTE.— Discharge estimated, December 4 to 22 and 25 to 28, May 21 to 24 and June 28 to 30. Hydrograph on gage-height record intermittent and breaks estimated, November 12 to 16 and 24 to 27. Chain gage observations made once daily, used December 29 to January 21, inclusive. Stage-discharge relation not affected by ice.

Monthly discharge of SUSQUEHANNA RIVER AT CONKLIN, for the year ended June 30, 1919

[Drainage area, 2,350 square miles]

Month	Discharge in second-feet: Maximum	Minimum	Mean	Per square mile	Run-off: Depth in inches on drainage area
July	2,510	656	1,400	0.596	0.69
August	768	488	558	0.238	0.27
September	7,100	544	1,750	0.744	0.83
October	15,100	1,350	3,200	1.36	1.57
November	14,000	1,940	4,120	1.75	1.95
December	8,000	1,750	4,140	1.76	2.03
January	10,200	2,440	4,110	1.75	2.02
February	3,680	1,300	1,960	0.834	0.87
March	9,240	3,500	5,760	2.45	2.82
April	12,300	3,500	6,180	2.63	2.93
May	12,100	1,940	5,200	2.21	2.55
June	1,810	719	1,060	0.451	0.50
The year	15,100	488	3,286	1.40	19.03

CHENANGO RIVER

CHENANGO RIVER NEAR CHENANGO FORKS

Location.—About 1½ miles below Tioughnioga river, 2 miles by road below Chenango Forks post-office, Broome county, and 11½ miles above Binghamton and the mouth.

Drainage area.— 1,420* square miles. See "Diversions."

Records available.— November 11, 1912, to June 30, 1919. Records were obtained at Binghamton, July 31, 1901, to December 31, 1911.

Gage.— Stevens water-stage recorder on the left bank on the farm of Erastus Ingraham.

Discharge measurements.— Made from cable about 100 feet above the gage by wading.

Channel and control.— Sand, gravel and small cobblestones; practically permanent.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 8.1 feet at 7:50 A. M., October 31; discharge, 11,800 second-feet. Minimum stage, from water-stage recorder, 2.4 feet at 4 P. M., August 4, and 7 A. M., August 5; discharge, 170 second-feet.

1901–1919: Maximum stage recorded, 12.18 feet from noon until 1 P. M., April 2, 1916; discharge, 27,900 second-feet. Minimum discharge recorded occurred at gage height 4.6 feet at the former station in Binghamton at 8 A. M., August 28, 1909; discharge, about 10 second-feet.

Ice.—Stage-discharge relation affected by ice.

Diversions.— The run-off from 87.3 square miles at head of Chenango river and from 15.7 square miles at head of Tioughnioga river is stored in reservoirs and except for discharge over the spillways it is diverted out of the drainage area into the Erie canal. The above-mentioned drainage area for Chenango river does not include these two areas.

Accuracy.— Stage-discharge relation practically permanent; usually affected by ice for a large part of the period from January to March, inclusive. Rating curve well defined between 120 and 35,000 second-feet. Operation of the water-stage recorder fairly satisfactory throughout the year. Daily discharge ascertained by

* Revised area as computed by engineers of the State Conservation Commission. Formerly given as 1,380 square miles.

applying to the rating table mean daily gage heights, determined by inspecting gage height graph or for days of considerable fluctuation by averaging the hourly discharge. Results good except for periods when stage-discharge was affected by ice, when results were fairly good.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of CHENANGO RIVER NEAR CHENANGO FORKS, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Aug. 16	E. D. Burchard	3.01	559
1919			
Jan. 21	C. C. Covert	3.63	1,400
May 7	J. W. Moulton	4.35	2,370
May 12	J. W. Moulton	6.69	7,730
June 30	C. C. Covert	2.82	381

Daily gage height, in feet, of CHENANGO RIVER NEAR CHENANGO FORKS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	4.8	2.93	2.73	3.68	7.4	3.50	*b*	3.64	*b*	4.65	4.5	3.69
2	4.05	2.83	2.76	3.75	6.6	3.42	*b*	3.57	*b*	4.55	4.7	3.59
3	*b*	2.71	2.76	3.92	4.9	3.45	5.8	3.63	5.05	4.6	4.55	3.49
4	*b*	2.55	2.76	3.82	4.5	3.54	5.15	3.59	4.75	5.35	4.3	3.42
5	*b*	2.58	2.76	4.2	4.2	3.60	4.7	3.58	4.95	5.7	4.7	3.34
6	*b*	2.81	2.76	4.5	4.1	3.60	4.5	3.54	5.1	5.75	4.65	3.29
7	*b*	2.81	2.76	4.8	3.98	3.60	4.5	3.39	4.55	5.6	4.5	3.33
8	3.20	2.87	2.76	4.7	3.88	3.65	4.45	3.36	4.35	5.55	4.75	3.28
9	3.15	2.73	2.76	4.4	3.80	3.70	4.45	3.29	*b*	5.8	4.65	3.20
10	3.20	2.92	2.76	4.0	3.80	3.80	4.1	3.34	*b*	5.85	*b*	3.19
11	*b*	3.00	2.76	3.85	3.80	3.90	4.1	3.25	6.1	6.35	7.5	3.17
12	*b*	2.92	2.76	3.35	3.65	4.1	4.0	3.30	5.25	7.4	6.7	3.12
13	4.05	2.92	2.83	3.38	3.40	5.1	3.87	3.24	4.95	6.9	6.6	3.07
14	3.82	3.30	3.02	3.22	3.40	5.9	3.88	*b*	4.6	6.2	5.8	3.03
15	3.83	3.11	3.19	3.22	3.55	6.6	3.87	5.0	4.3	5.6	5.25	3.00
16	*b*	2.86	3.22	3.20	3.55	6.1	3.83	4.45	*b*	5.3	5.0	2.96
17	*b*	2.86	3.19	3.20	4.25	5.6	3.72	3.90	6.0	5.5	5.05	3.10
18	*b*	2.86	3.32	3.18	6.9	5.1	3.76	3.78	6.2	5.4	5.6	3.15
19	*b*	2.86	3.40	3.18	6.3	4.3	3.77	3.57	5.85	5.1	4.95	3.01
20	*b*	2.86	4.0	3.18	5.6	4.1	3.71	3.50	5.2	4.8	4.6	3.01
21	*b*	2.83	4.5	3.24	4.95	4.05	3.66	3.44	5.0	4.75	4.45	3.02
22	*b*	2.76	3.88	3.60	4.5	*b*	3.66	3.39	4.8	4.55	4.45	3.00
23	3.02	2.71	3.95	3.40	4.3	5.6	3.78	3.40	4.5	4.3	......	2.93
24	3.22	2.71	4.25	3.20	4.15	5.15	*b*	3.41	4.35	4.35	5.65	2.88
25	3.32	2.71	4.8	3.35	3.94	*b*	*b*	3.42	4.2	4.65	5.55	2.85
26	3.15	2.71	5.2	3.48	3.85	5.75	4.45	3.68	4.05	4.5	5.15	2.84
27	3.00	2.71	5.25	3.42	3.80	5.05	4.25	3.52	*b*	4.5	4.7	2.83
28	2.76	2.71	4.5	3.20	3.70	4.75	4.2	*b*	*b*	4.75	4.4	2.89
29	3.07	2.71	3.92	3.32	3.58	4.45	3.98	......	5.2	4.9	4.15	2.88
30	2.94	2.71	3.70	3.72	3.52	4.45	3.90	......	4.85	4.75	3.95	2.82
31	2.94	2.71	......	8.0	......	4.3	3.79	......	4.9	......	3.80	......

b See note under next table.

Daily discharge, in second-feet, of CHENANGO RIVER NEAR CHENANGO FORKS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	3,160	496	338	1,320	9,700	1,090	2,650	1,270	6,480	2,880	2,610	1,340
2	1,860	414	360	1,420	7,370	994	6,830	1,180	5,890	2,700	2,970	1,210
3	1,600	322	360	1,660	3,350	1,030	5,310	1,260	3,650	2,790	2,700	1,080
4	1,400	232	360	1,520	2,610	1,140	3,860	1,210	3,060	4,280	2,270	994
5	1,200	246	360	2,100	2,100	1,220	2,970	1,190	3,450	5,070	2,970	904
6	950	398	360	2,610	1,940	1,220	2,610	1,140	3,750	5,190	2,880	849
7	850	398	360	3,160	1,750	1,220	2,610	959	2,700	4,840	2,610	893
8	750	446	360	2,970	1,600	1,280	2,520	926	2,360	4,720	3,060	838
9	700	338	360	2,440	1,490	1,350	2,520	849	4,600	5,310	2,880	750
10	750	487	360	1,780	1,490	1,490	1,940	904	9,340	5,430	6,690	740
11	2,000	555	360	1,560	1,490	1,630	1,940	805	6,050	6,700	10,000	720
12	2,930	487	360	915	1,280	1,940	1,780	860	4,060	9,700	7,650	670
13	1,860	487	414	948	970	3,750	1,560	794	3,450	8,210	7,370	622
14	1,520	860	574	772	970	5,550	1,600	1,270	2,790	6,310	5,310	584
15	1,530	660	740	772	1,160	7,370	1,590	3,550	2,270	4,840	4,060	555
16	1,300	438	772	750	1,160	6,050	1,530	2,520	2,670	4,170	3,550	521
17	1,200	438	740	750	2,180	4,840	1,380	1,630	5,800	4,610	3,650	650
18	1,400	438	882	730	8,210	3,750	1,430	1,460	6,310	4,390	4,840	700
19	1,100	438	970	730	6,570	2,270	1,450	1,180	5,430	3,750	3,450	584
20	900	438	1,780	730	4,840	1,940	1,360	1,090	3,960	3,160	2,790	584
21	750	414	2,610	794	3,450	1,860	1,300	1,020	3,550	3,060	2,520	574
22	650	360	1,600	1,220	2,610	2,240	1,300	959	3,160	2,700	2,520	555
23	570	322	1,700	970	2,270	4,840	1,460	970	2,610	2,270	4,260	496
24	774	322	2,180	750	2,020	3,860	4,160	982	2,360	2,360	4,960	454
25	882	322	3,160	915	1,690	5,180	3,220	994	2,100	2,880	4,720	430
26	700	322	3,960	1,070	1,560	5,190	2,520	1,320	1,860	2,610	3,860	422
27	555	322	4,060	994	1,490	3,650	2,180	1,120	2,000	2,610	2,970	414
28	360	322	2,610	750	1,350	3,060	2,100	1,090	6,190	3,060	2,440	462
29	622	322	1,660	882	1,190	2,520	1,750	......	3,960	3,350	2,020	454
30	504	322	1,350	1,380	1,120	2,520	1,630	......	3,260	3,060	1,700	406
31	504	322	......	11,500	......	2,270	1,480	......	3,350	......	1,490	......
Mean	1,160	409	1,200	1,640	2,700	2,850	2,340	1,230	3,950	4,230	3,800	680

NOTE.— Discharge, July 23 to September 30, determined from semidaily observations on the staff gage. Discharge, July 3 to 7 and 16 to 22, estimated by comparison of gage-height graph with that for the Susquehanna river at Conklin. Stage-discharge relation not affected by ice.

Monthly discharge of CHENANGO RIVER NEAR CHENANGO FORKS, for the year ended June 30, 1919

[Drainage area, 1,420 square miles]

MONTH	Discharge in second-feet				Run-off
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	3,160	360	1,160	0.841	0.97
August	860	232	409	0.296	0.34
September	4,060	338	1,200	0.870	0.97
October	11,500	730	1,640	1.16	1.34
November	9,700	970	2,700	1.90	2.12
December	7,370	994	2,850	2.01	2.32
January	6,830	1,300	2,340	1.65	1.90
February	3,550	794	1,230	0.866	0.90
March	9,340	1,860	3,950	2.78	3.20
April	9,700	2,270	4,230	2.98	3.32
May	10,000	1,490	3,800	2.68	3.09
June	1,340	406	680	0.479	0.53
The year	11,500	232	2,182	1.53	21.00

CHEMUNG RIVER

DESCRIPTION

Chemung river is formed at Painted Post by the confluence of Tioga and Cohocton rivers. Cohocton river lies entirely in the state of New York. Tioga river receives, just above its mouth, Canisteo river, a large tributary, which also has its drainage basin in New York to the south of Cohocton. The drainage area of Tioga river, above the Canisteo, is mainly in Pennsylvania. Chemung river flows southeastward through Corning, Elmira and Chemung, crosses the state line and flows for a short distance in Pennsylvania, then returns to New York and crosses again to Pennsylvania near Waverly, finally emptying into the Susquehanna near Athens, Bradford county, Pa. The total length of the river is about 40 miles, of which 30 miles lie in New York. The drainage area, measured at the mouth, is 2,520 square miles.

The topographic features of the basin are, as a rule, bold and broad. The hills rise to a height of several hundred feet on either side, within a short distance of the stream. The upland plateau is to a large extent wooded, has impervious soil, no lake storage and few marsh areas. Tributaries are ramifying and uniformly distributed, though not very numerous, and dry gullies, or flood channels, are common. The main river is sluggish, with low banks and a broad valley, or flood plain, which is often overflowed. The concentration of storm waters from the three large streams, which unite just above Corning, makes possible excessive floods. Dikes have been erected in the cities of Elmira and Corning for protection. One of the highest recorded freshets in the stream occurred June 1, 1889. It was preceded by phenomenal rainfall, aggregating several inches in a few hours during the night of May 31. The discharge at this time has been estimated at 67 second-feet per square mile from 2,055 square miles, or 138,000 second-feet.[a]

[a] Report of Francis Collingwood, C. E., on "The Protection of the City of Elmira against Floods."

CHEMUNG RIVER AT CHEMUNG

Location.— At the new highway bridge, about midway between Chemung, Chemung county, N. Y., and Willawana, Pa., half a mile upstream from the state line and about 10 miles above the mouth of the river.

Drainage area.— 2,440 square miles.

Records available.— September 11, 1903, to June 30, 1919.

Gage.— Tape gage at the upstream side of the right span of the bridge. Gage read by D. L. Orcutt.

Discharge measurements.— Made from the bridge at medium and high stages and by wading at low stages.

Channel and control.— Sand and gravel; occasionally shifting.

Extremes of discharge.— Current year: Maximum stage recorded, 16.72 feet at 6:38 A. M., May 23; discharge, about 57,900 second-feet. Minimum stage recorded, 1.64 feet at 7:30 A. M., August 30; discharge, 170 second-feet.

1903–1919: Maximum stage recorded, 17.96 feet at 7 A. M., March 15, 1918; discharge, about 67,000 second-feet. Minimum stage recorded, 1.47 feet at 7 A. M., August 14, 1911; discharge, about 49 second-feet.

Ice.— Stage-discharge relation affected by ice.

Regulation.— Power is developed above the station, the largest plant being at Elmira.

Accuracy.— Stage-discharge relation probably permanent between dates of shift; affected by ice for a large portion of the period from December to March, inclusive. Rating curve well defined between 200 and 45,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage heights to rating table. Results good except during periods when the stage-discharge relation was affected by ice. Results fair for those periods.

Coöperation.— Station established and maintained by United States Geological Survey in coöperation with the State Engineer and Surveyor.

Discharge measurements of CHEMUNG RIVER AT CHEMUNG, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 19	E. D. Burchard	2.03	336
1919			
Jan. 22	E. D Burchard	3.17	1,270
May 6	J. W. Moulton	3.76	1,910
June 29	C. C. Covert	3.34	1,380

Daily gage height, in feet, of CHEMUNG RIVER AT CHEMUNG, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	2.5	1.98	1.70	2.9	5.0	2.9	3.2	2.7	3.45	4.7	3.9	4.2
2	2.43	1.95	1.76	2.8	4.1	2.7	4.3	2.6	5.1	4.3	4.1	3.9
3	2.37	1.90	1.80	3.1	3.8	2.8	4.9	2.6	4.0	4.2	4.0	3.7
4	2.34	1.89	1.84	3.8	3.6	2.75	4.0	2.8	3.8	4.4	3.7	3.6
5	2.30	2.06	1.78	3.3	3.45	2.7	3.5	2.65	3.8	5.1	3.7	3.45
6	2.27	1.96	1.78	4.7	3.6	2.7	3.7	2.55	4.5	5.0	3.8	3.3
7	2.24	2.24	1.80	6.5	3.35	2.6	4.1	2.39	4.2	4.7	3.6	3.8
8	2.16	2.08	2.05	6.0	3.2	2.65	4.0	2.5	3.9	5.6	3.7	4.1
9	2.12	2.02	1.96	5.3	3.1	2.85	4.0	2.30	4.6	6.7	3.8	3.7
10	2.12	1.98	1.92	5.0	3.0	3.6	3.7	2.40	7.7	6.2	8.1	4.4
11	2.12	2.14	1.80	4.8	2.95	3.25	3.5	2.25	5.7	7.8	11.8	3.9
12	2.17	2.5	1.78	3.35	2.9	3.15	3.8	2.31	5.1	8.6	11.0	3.5
13	2.22	2.36	1.85	3.05	2.85	3.2	3.8	2.29	4.6	7.1	8.9	3.35
14	2.14	2.16	1.90	3.05	2.75	3.6	3.45	2.47	4.2	6.2	7.0	3.1
15	2.06	2.09	2.35	2.95	2.7	4.9	3.45	3.25	3.7	5.5	6.1	3.0
16	2.06	1.99	2.13	3.0	2.65	5.1	3.4	3.5	3.8	5.7	5.6	2.95
17	2.04	1.96	3.21	2.85	2.6	4.4	3.4	3.05	5.7	6.9	5.6	3.2
18	2.00	1.92	2.8	2.6	4.6	4.0	3.3	2.95	6.7	5.9	6.8	3.2
19	1.98	1.86	3.15	2.55	6.1	3.7	3.4	2.65	6.5	5.3	5.3	2.95
20	1.98	1.79	3.4	2.5	5.2	3.45	3.2	2.7	5.3	4.9	5.9	2.8
21	1.96	1.77	5.8	2.5	4.9	3.35	3.2	2.8	4.9	4.7	10.0	2.9
22	1.95	1.74	4.2	2.48	4.2	3.35	3.15	2.7	4.7	4.6	14.8	3.6
23	1.92	1.74	3.6	2.5	4.0	3.8	3.2	2.65	4.5	4.2	16.1	3.05
24	1.92	1.74	3.25	2.43	3.7	4.1	3.3	2.7	4.1	4.0	12.6	2.8
25	1.92	1.71	3.0	2.38	3.45	3.9	3.9	2.7	3.9	4.2	11.1	2.7
26	2.21	1.70	3.3	2.42	3.3	4.1	3.6	2.8	3.7	4.0	8.5	2.6
27	2.19	1.66	3.9	2.38	3.1	3.8	3.45	2.85	3.6	4.0	7.0	2.7
28	2.06	1.67	3.5	2.42	3.0	3.5	3.2	2.75	*b*	4.0	6.1	4.2
29	1.98	1.69	3.25	2.46	2.95	3.35	3.15	......	5.0	4.1	5.4	3.45
30	1.96	1.66	2.95	2.5	2.95	3.2	3.1	......	4.7	4.1	4.8	3.05
31	1.94	1.68	......	3.7	......	3.05	2.8	......	5.1	......	4.5	......

b See note under next table.

Daily discharge, in second-feet, of CHEMUNG RIVER AT CHEMUNG, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	630	299	168	960	4,040	960	1,250	790	1,540	3,460	2,140	2,600
2.....	581	282	192	870	2,440	790	2,760	710	4,240	2,760	2,440	2,140
3.....	539	255	208	1,150	2,000	870	3,840	710	2,290	2,600	2,290	1,860
4.....	518	250	227	2,000	1,730	830	2,290	870	2,000	2,930	1,860	1,730
5.....	490	343	200	1,360	1,540	790	1,600	750	2,000	4,240	1,860	1,540
6.....	470	238	200	3,460	1,730	790	1,860	670	3,100	4,040	2,000	1,360
7.....	451	451	208	7,560	1,420	710	2,440	553	2,600	3,460	1,730	2,030
8.....	401	354	338	6,240	1,250	750	2,290	630	2,140	5,300	1,860	2,440
9.....	377	321	288	4,650	1,150	915	2,290	490	3,280	8,140	2,000	1,8[illegible]0
10.....	377	299	266	4,040	1,050	1,730	1,860	560	11,400	6,750	12,800	2,930
11.....	377	389	208	3,650	1,000	1,300	1,600	458	5,530	11,700	28,000	2,140
12.....	407	630	200	1,420	960	1,200	2,000	497	4,240	14,600	20,000	1,600
13.....	438	532	232	1,100	915	1,250	2,000	484	3,280	9,380	15,700	1,4[illegible]0
14.....	389	401	255	1,100	830	1,730	1,540	609	2,600	6,750	9,060	1,150
15.....	343	360	525	1,000	790	3,840	1,540	1,300	1,860	5,080	6,490	1,030
16.....	343	302	383	1,050	750	4,240	1,480	1,600	2,000	5,530	5,300	1,0[illegible]0
17.....	332	288	432	915	710	2,930	1,480	1,100	5,530	8,750	5,300	1,2[illegible]0
18.....	310	266	870	710	3,280	2,290	1,360	1,000	8,140	6,000	8,440	1,2[illegible]0
19.....	299	236	1,200	670	6,490	1,860	1,480	750	7,560	4,650	4,650	1,000
20.....	299	204	1,480	630	4,440	1,540	1,250	790	4,650	3,840	6,000	870
21.....	288	196	5,760	630	3,840	1,420	1,250	870	3,840	3,460	20,000	960
22.....	282	184	2,600	616	2,600	1,420	1,200	790	3,460	3,280	44,800	1,730
23.....	266	184	1,730	630	2,290	2,000	1,250	750	3,100	2,600	53,500	1,100
24.....	266	184	1,300	581	1,860	2,440	1,360	790	2,440	2,290	32,000	870
25.....	266	172	1,050	546	1,540	2,140	2,140	790	2,140	2,600	24,800	790
26.....	432	168	1,360	574	1,360	2,440	1,730	870	1,860	2,290	14,200	710
27.....	419	154	2,140	546	1,150	2,000	1,540	915	1,730	2,290	9,060	790
28.....	343	157	1,600	574	1,050	1,600	1,250	830	5,500	2,290	6,490	2,600
29.....	299	164	1,300	602	1,000	1,420	1,200	......	4,040	2,440	4,860	1,5[illegible]0
30.....	288	154	1,000	630	1,000	1,250	1,150	......	3,460	2,440	3,650	1,100
31.....	277	161	......	1,860	......	1,100	870	......	4,240	......	3,100	......
Mean...	380	278	931	1,690	1,870	1,630	1,710	783	3,730	4,860	11,500	1,510

NOTE.— Discharge estimated, March 28, by comparing with hydrographs of Susquehanna river at Conklin and Chenango river at Chenango Forks. Stage-discharge relation not affected by ice.

Monthly discharge of CHEMUNG RIVER AT CHEMUNG, for the year ended June 30, 1919

[Drainage area, 2,440 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	630	266	380	0.156	0.18
August	630	154	278	0.114	0.13
September	5,760	168	931	0.382	0.43
October	7,560	546	1,690	0.693	0.80
November	6,490	710	1,870	0.766	0.85
December	4,240	710	1,630	0.668	0.77
January	3,840	870	1,710	0.701	0.81
February	1,600	458	783	0.321	0.33
March	11,400	1,540	3,730	1.53	1.76
April	14,600	2,290	4,860	1.99	2.22
May	53,500	1,730	11,500	4.71	5.43
June	2,930	710	1,510	0.619	0.69
The year	53,500	154	2,573	1.05	14.40

TIOGA RIVER

TIOGA RIVER NEAR ERWINS

Location.—At highway bridge ¼ mile below the mouth of the Canisteo river, near the village of Erwins, Steuben county, and about 3 miles above the junction of the Tioga and Cohocton rivers to form the Chemung river at the town of Painted Post.

Drainage area.— 1,320 square miles. (Furnished by Mr. Robert O. Hayt.)

Records available.— July 12, 1918, to June 30, 1919.

Gage.— Chain near left abutment, downstream side of bridge; graduated and read to quarter-tenths twice daily by Miss Jane Sexton.

Discharge measurements.— Made from bridge and at low stages by wading near the control one hundred yards downstream.

Channel and control.— Well compacted gravel; probably permanent.

Extremes of discharge.— Current year: Maximum stage recorded, 16.4 feet at 4 P. M., May 22, 1919; beyond the limits of present rating curve. Minimum stage recorded, 0.92 foot, August 30, 1918; discharge, 54 second-feet.

Ice.— Stage-discharge relation affected by ice.

Regulation.— There is no considerable storage to interfere with the seasonal flow.

Accuracy.— Stage-discharge relation believed to be fairly permanent; probably affected by ice from December to March. Rating curve well defined below a discharge of 12,000 second-feet.

Coöperation.— Station established by the Lamoka Power Company under the direction of the United States Geological Survey. Maintained by the Survey in coöperation with the Power Co. and the State of New York.

Discharge measurements of TIOGA RIVER NEAR ERWINS, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 17	E. D. Burchard	1.15	125
July 17	E. D. Burchard	1.15	124
Aug. 17	C. C. Covert	1.28	143
Nov. 21	E. D. Burchard	3.38	1,770
Nov. 21	E. D. Burchard	3.36	1,710
1919			
Jan. 27	E. D. Burchard	2.27	798
Mar. 6	E. D. Burchard	3.97	2,680
April 4	J. W. Moulton	3.43	1,920
April 13	M. H. Carson	4.97	4,300
April 15	M. H. Carson	3.74	2,170
April 21	M. H. Carson	3.47	1,900
May 12	J. W. Moulton	8.38	12,000
May 26	O. W. Hartwell	5.84	5,900

Daily gage height, in feet, of TIOGA RIVER NEAR ERWINS, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	......	1.22	*a*	1.96	3.4	2.05	2.15	1.70	4.2	3.2	2.45	2.75
2	......	1.14	*a*	2.0	2.85	1.86	4.3	1.90	3.3	2.9	2.6	2.6
3	......	1.04	1.17	2.65	2.6	1.97	3.3	2.05	2.9	3.0	2.5	2.45
4	......	1.09	1.10	2.65	2.5	1.92	2.6	1.84	2.75	3.3	2.3	2.35
5	......	1.24	1.17	2.3	2.65	1.93	2.05	1.74	2.65	3.7	2.5	2.25
6	......	1.96	1.14	5.4	2.55	1.91	2.1	1.73	3.8	3.5	2.4	2.15
7	......	1.36	1.44	3.8	2.35	1.84	2.3	1.77	3.0	3.2	2.3	2.5
8	......	1.34	1.37	3.1	2.25	1.92	2.5	1.67	2.95	5.6	2.45	2.65
9	1.03	1.26	1.30	2.7	2.15	3.0	2.45	1.70	4.7	5.4	2.47	2.8
10	......	1.42	1.17	2.45	2.1	2.55	*a*	1.53	5.4	5.4	8.6	2.65
11	......	1.94	1.12	2.25	2.05	2.25	*a*	*a*	5.2	5.8	9.2	2.25
12	1.18	1.89	1.14	2.15	2.0	2.2	*a*	*a*	3.5	6.4	8.2	2.1
13	1.23	1.56	1.24	2.05	1.93	2.3	*a*	*a*	3.3	4.9	6.0	1.99
14	1.20	1.49	1.77	2.1	1.90	3.0	*a*	1.58	2.8	4.2	4.8	1.87
15	1.16	1.40	1.54	1.98	1.84	4.0	2.2	3.0	2.65	3.8	4.1	1.81
16	1.10	1.32	1.40	1.94	1.82	3.5	2.75	2.4	2.7	4.8	3.9	1.77
17	1.13	1.32	1.70	1.84	1.77	3.0	2.6	2.0	4.4	5.1	4.0	2.1
18	1.16	1.22	2.65	1.82	6.0	2.7	2.3	2.05	5.9	4.1	4.6	1.93
19	1.09	1.17	2.4	1.73	4.8	2.55	2.45	1.74	4.4	3.7	3.7	1.78
20	1.12	1.13	4.8	1.70	3.7	2.4	2.5	2.05	3.7	3.4	3.3	1.83
21	1.16	1.12	3.8	1.68	3.3	2.35	2.3	1.86	3.5	3.4	13.8	4.0
22	1.19	1.13	2.95	1.70	3.0	2.35	2.2	1.78	3.3	3.1	15.0	2.35
23	1.16	1.11	2.5	1.64	2.8	3.4	2.45	1.80	2.95	2.85	14.1	2.05
24	1.14	1.06	2.3	1.62	2.6	2.9	3.5	1.83	2.75	2.75	9.0	1.84
25	1.12	*a*	2.1	1.63	2.45	2.85	2.85	1.85	2.6	*a*	7.8	1.74
26	1.26	*a*	2.5	1.57	2.3	2.9	2.6	2.0	2.5	2.7	5.6	1.76
27	1.22	*a*	2.8	1.63	2.1	2.55	2.4	1.89	2.5	2.75	4.8	3.2
28	1.14	*a*	2.45	1.64	2.1	2.5	2.25	1.89	4.3	2.7	4.1	3.0
29	1.04	*a*	2.15	1.66	2.1	2.25	2.25	......	3.5	2.75	3.6	2.4
30	1.08	9.2	2.0	1.66	2.15	2.15	2.5	......	3.3	2.65	3.3	2.1
31	1.08	*a*	......	3.9	......	2.1	1.88	......	3.8	......	3.0	......

a No record.

Daily discharge, in second-feet, of TIOGA RIVER NEAR ERWINS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	......	138	50	562	1,840	625	700	390	2,920	1,620	940	1,200
2	......	112	90	590	1,280	492	3,080	520	1,730	1,330	1,060	1,060
3	......	82	121	1,100	1,060	569	1,730	625	1,330	1,420	980	940
4	......	97	100	1,100	980	534	1,060	478	1,200	1,730	820	860
5	......	146	121	820	1,100	541	625	414	1,100	2,210	980	780
6	......	562	112	4,990	1,020	527	660	408	2,340	1,960	900	700
7	......	200	240	2,340	860	478	820	432	1,420	1,620	820	980
8	......	190	205	1,520	780	534	980	372	1,380	5,370	940	1,100
9	79	151	170	1,150	700	1,420	940	390	3,750	4,990	940	1,240
10	......	230	121	940	660	1,020	900	288	4,990	4,990	12,600	1,100
11	......	548	106	780	625	780	880	270	2,920	5,760	14,400	780
12	124	513	112	700	590	740	860	260	1,960	7,010	11,500	660
13	142	306	146	625	541	820	850	250	1,730	4,090	6,160	583
14	130	265	432	660	520	1,420	850	318	1,240	2,920	3,920	499
15	118	220	194	576	478	2,620	740	1,420	1,100	2,340	2,770	457
16	100	180	220	548	464	1,960	1,200	900	1,150	3,920	2,480	432
17	109	180	390	478	432	1,420	1,060	590	3,240	4,450	2,620	660
18	118	138	1,100	461	6,160	1,150	820	625	5,960	2,770	3,580	541
19	97	121	900	408	3,920	1,020	940	414	3,240	2,210	2,210	438
20	106	109	3,920	390	2,210	900	980	625	2,210	1,840	1,730	471
21	118	106	2,340	378	1,730	860	820	492	1,960	1,840	32,500	2,620
22	127	109	1,380	390	1,420	860	740	438	1,730	1,520	38,000	860
23	118	103	980	351	1,240	1,840	940	450	1,380	1,280	34,000	625
24	112	88	820	342	1,060	1,330	1,960	471	1,200	1,200	13,800	478
25	106	80	660	348	940	1,280	1,280	485	1,060	1,200	10,400	414
26	154	70	980	312	820	1,330	1,060	590	980	1,150	5,370	426
27	138	65	1,240	318	660	1,020	900	513	980	1,200	3,920	1,620
28	112	60	940	351	660	980	780	513	3,080	1,150	2,770	1,420
29	82	60	700	363	660	780	780	......	1,960	1,200	2,080	900
30	94	54	590	366	700	700	625	......	1,730	1,100	1,730	660
31	94	50	......	2,480	......	660	506	......	2,340	......	1,420	......
Mean	......	172	653	864	1,200	1,010	1,000	498	2,110	2,580	7,040	850

NOTE.— Daily discharge, August 25 to 29 and 31 to September 2, January 10 to 14, February 11 to 13 and April 25, estimated, because of no gage height record, by comparing with hydrograph of Chemung river at Chemung, minus Cohocton river near Campbell.

Monthly discharge of TIOGA RIVER NEAR ERWINS, for the year ended June 30, 1919

[Drainage area, 1,320 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	....	....	....	....	....
August	562	50	172	0.130	0.15
September	3,920	50	653	0.495	0.55
October	4,990	312	864	0.655	0.76
November	6,160	432	1,200	0.909	1.01
December	2,620	478	1,010	0.765	0.88
January	3,080	506	1,000	0.758	0.87
February	1,420	250	498	0.377	0.39
March	5,960	980	2,110	1.60	1.84
April	7,010	1,100	2,580	1.95	2.18
May	38,000	820	7,040	5.33	6.14
June	2,620	414	850	0.644	0.72

COHOCTON RIVER

COHOCTON RIVER NEAR SAVONA

Location.— Just below the highway bridge, about 1¼ miles above the village of Savona and 4½ miles downstream from the village of Bath, Steuben county.

Drainage area.— 383 square miles. (Furnished by Mr. Robert O. Hayt.)

Records available.— March 3, 1919, to June 30, 1919.

Gage.— Standard sloping and vertical staff. Slope gage supported on concrete piers located in left bank 200 feet downstream from highway bridge. Vertical section spiked to downstream side of ash tree about 12 inches in diameter and 15 feet back from edge of bank. Read by Kenneth D. Ward.

Discharge measurements.— Made from standard cable equipment at medium and high stages; by wading just above the gage during low water.

Channel and control.— Firmly bedded gravel; not likely to shift.

Extremes of discharge.— Current year: Maximum stage recorded, 9.18 feet at 6:30 A. M., May 23; discharge, 6,900 second-feet. Minimum stage recorded, 2.25 feet from 6:45 A. M., June 25, to 6:45 A. M., June 26; discharge, 138 second-feet.

Ice.— Stage-discharge relation probably affected by ice.

Regulation.— Seasonal distribution of flow is probably not affected by small reservoirs above.

Accuracy.— Stage-discharge relation fairly permanent; probably affected by ice from December to March. Rating curve well defined up to a discharge of 6,000 second-feet.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the Lamoka Electric Power Corporation (Robert O. Hayt, Chief Engineer).

Discharge measurements of COHOCTON RIVER NEAR SAVONA, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		Feet	Sec.-ft.
July 18	E. D. Burchard	1.87	62.2
July 18	E. D. Burchard	1.86	59.3
1919			
Jan. 27	E. D. Burchard	2.39	185
Mar. 6	E. D. Burchard	2.80	311
Apr. 4	J. W. Moulton	3.32	528
Apr. 13	M. H. Carson	5.02	1,710
Apr. 14	M. H. Carson	4.40	1,170
Apr. 15	M. H. Carson	4.01	957
Apr. 20	M. H. Carson	3.22	523
May 22	O. W. Hartwell	8.40	5,740
May 25	O. W. Hartwell	6.59	3,300

Daily gage height, in feet, of COHOCTON RIVER NEAR SAVONA, for the year ended June 30, 1919

Day	Mar.	April	May	June	Day	Mar.	April	May	June
1		2.9	3.4	3.15	16	3.1	4.1	3.8	2.65
2		2.85	3.45	3.0	17	4.0	3.9	4.1	3.15
3	2.7	2.95	3.25	2.9	18	4.8	3.55	3.95	2.7
4	2.7	3.3	3.25	2.8	19	4.0	3.4	3.6	2.6
5	2.95	3.35	3.3	2.7	20	3.75	3.25	3.4	2.55
6	2.9	3.0	3.1	2.65	21	3.5	3.25	8.1	2.5
7	2.6	3.1	3.05	3.45	22	3.3	3.05	8.4	2.39
8	2.5	3.2	3.0	3.2	23	3.1	2.9	8.6	2.24
9	3.5	3.7	3.0	3.7	24	3.0	3.3	7.5	2.29
10	3.7	4.8	6.5	3.7	25	2.9	3.25	6.6	2.25
11	3.4	5.4	7.0	3.3	26	2.8	3.25	5.5	2.32
12	3.2	5.8	6.3	3.0	27	2.85	3.2	4.7	2.7
13	3.1	5.1	5.4	2.8	28	3.2	3.3	4.2	2.6
14	2.6	4.5	4.5	2.7	29	3.05	3.8	3.75	2.42
15	2.7	4.0	4.1	2.65	30	3.05	3.5	3.5	2.29
					31	3.3		3.3	

NOTE.—Record began March 3, 1919.

Daily discharge, in second-feet, of COHOCTON RIVER NEAR SAVONA, for the year ended June 30, 1919

DAY	Mar.	April	May	June	DAY	Mar.	April	May	June
1	650	358	595	470	16	445	1,000	815	264
2	380	338	620	400	17	935	875	1,000	470
3	282	379	520	358	18	1,520	672	905	282
4	282	545	520	319	19	935	595	700	247
5	379	570	545	282	20	785	520	595	230
6	358	400	445	264	21	645	520	5,270	214
7	247	445	422	620	22	545	422	5,700	179
8	214	495	400	495	23	445	358	6,000	164
9	645	755	400	755	24	400	545	4,440	149
10	755	1,520	3,200	755	25	358	520	3,310	138
11	595	2,060	3,790	545	26	319	520	2,150	158
12	495	2,450	2,980	400	27	338	495	1,440	282
13	445	1,780	2,060	319	28	495	545	1,060	247
14	247	1,280	1,280	282	29	422	815	785	188
15	282	935	1,000	264	30	422	645	645	149
					31	545	......	545	......
					Mean	510	779	1,750	330

NOTE.— Daily discharge estimated, March 1 and 2, by comparing with hydrograph of Cohocton river near Campbell.

Monthly discharge of COHOCTON RIVER NEAR SAVONA, for the year ended June 30, 1919

[Drainage area, 383 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
March	1,520	214	510	1.33	1.53
April	2,450	338	779	2.03	2.26
May	6,000	400	1,750	4.57	5.27
June	755	138	330	0.862	0.96

COHOCTON RIVER NEAR CAMPBELL

Location.— At the highway bridge, known locally as Red bridge, nearly 2 miles upstream from the town of Campbell, Steuben county, and about midway between Campbell and Savona.

Drainage area.— 480 square miles. (Furnished by Mr. Robert O. Hayt.)

Records available.— July 11, 1918, to June 30, 1919.

Gage.— Standard chain gage secured to the downstream handrail of the bridge near the left abutment. Read by Miss Dora Wood.

Discharge measurements.— Made from bridge or by wading.

Channel and control.— Firmly-bedded gravel; not likely to shift.

Extremes of discharge.— Current year: Maximum stage recorded, 7.75 feet at 7:30 A. M., May 23; discharge, 9,280 second-feet. Minimum stage recorded, 0.67 foot, several times in September; discharge, 60 second-feet.

Ice.— Stage-discharge relation probably affected by ice.

Regulation.— Seasonal distribution of flow is probably not affected by small reservoirs above.

Accuracy.— Stage-discharge relation practically permanent. Usually affected by ice from December to March. Rating curve well defined for discharges up to 6,500 second-feet.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the Lamoka Electric Power Corporation (Robert O. Hayt, Chief Engineer).

Discharge measurements of COHOCTON RIVER NEAR CAMPBELL, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
July 17	E. D. Burchard	0.82	94.2
July 17	E. D. Burchard	0.82	91.3
July 19	E. D. Burchard	0.85	106
Aug. 18	C. C. Covert	0.72	68.8
Nov. 21	E. D. Burchard	1.94	611
Nov. 21	E. D. Burchard	1.92	602
Dec. 28	C. C. Covert	1.46	298
1919			
Jan. 27	E. D. Burchard	1.23	225
Mar. 6	E. D. Burchard	1.54	375
Apr. 4	J. W. Moulton	1.97	630
Apr. 13	M. H. Carson	3.45	1,990
Apr. 14	M. H. Carson	3.07	1,630
Apr. 21	M. H. Carson	2.03	663
May 22	O. W. Hartwell	6.46	6,600
May 25	O. W. Hartwell	4.95	3,900

Daily gage height, in feet, of COHOCTON RIVER NEAR CAMPBELL, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	......	0.91	0.86	1.14	1.65	1.14	1.39	1.11	2.1	1.7	2.1	1.9
2	......	0.81	0.71	1.12	1.65	1.33	1.95	1.6	1.7	1.7	2.1	1.8
3	......	0.81	0.71	1.12	1.5	1.15	1.7	1.38	1.5	1.7	1.95	1.7
4	......	0.92	0.70	1.14	1.47	1.15	1.48	1.16	1.5	2.05	1.95	1.6
5	......	0.81	0.70	1.06	1.47	1.19	1.48	1.18	1.6	2.05	2.0	1.6
6	......	0.83	0.82	1.08	1.37	1.05	1.7	1.15	1.6	2.0	1.8	1.5
7	......	0.89	0.91	1.18	1.30	1.28	2.1	1.24	1.41	2.0	1.85	2.1
8	......	0.84	0.78	1.16	1.26	1.20	2.25	1.25	1.39	2.0	1.8	1.9
9	......	0.81	0.70	1.16	1.28	1.85	1.7	1.18	2.15	2.35	1.8	2.05
10	......	0.85	0.68	1.11	1.22	1.65	2.1	1.01	2.4	3.2	4.2	2.4
11	0.95	0.84	0.74	1.04	1.21	1.65	2.05	1.11	2.05	3.0	5.1	2.1
12	1.03	0.83	0.70	1.06	1.22	1.48	2.1	1.65	1.75	4.2	4.7	1.95
13	0.97	0.76	0.82	1.07	1.20	1.44	2.35	1.22	1.9	3.5	3.9	1.8
14	0.89	0.77	0.88	1.01	1.12	2.1	1.95	1.35	1.41	3.1	3.3	1.6
15	0.83	0.80	0.76	1.02	1.13	2.4	1.9	1.5	1.7	2.8	2.8	1.5
16	0.87	0.76	0.73	1.00	1.08	2.1	1.7	1.29	1.8	2.8	2.5	1.55
17	0.86	0.76	0.98	0.97	1.11	1.95	1.6	1.35	2.6	2.6	3.1	1.7
18	0.84	0.73	1.10	0.98	2.9	1.75	1.5	1.12	3.3	2.7	2.7	1.55
19	0.85	0.74	1.41	0.98	2.5	1.6	1.49	1.09	2.6	2.15	2.4	1.41
20	0.83	0.72	2.05	0.97	2.15	1.5	1.6	1.30	2.4	2.0	2.1	1.40
21	0.78	0.73	1.85	1.02	1.95	1.45	1.5	1.14	2.2	2.0	6.0	1.39
22	0.75	0.71	1.55	1.01	1.85	1.5	1.35	1.06	2.2	1.8	6.4	1.29
23	0.78	0.77	1.37	1.01	1.65	1.7	1.45	1.14	2.1	1.7	6.7	1.24
24	0.83	0.72	1.31	0.91	1.55	1.6	1.7	1.11	1.9	2.0	5.6	1.18
25	1.23	0.70	1.26	0.92	1.43	1.75	1.6	1.06	1.65	2.0	5.0	1.15
26	1.04	0.72	1.46	1.10	1.38	1.65	1.41	1.15	1.6	1.9	4.1	1.29
27	0.88	0.71	1.42	1.13	1.33	1.35	1.39	1.08	1.6	2.25	3.4	1.6
28	0.91	0.70	1.31	1.04	1.25	1.46	1.26	1.7	1.95	2.1	2.8	1.5
29	0.84	0.70	1.22	1.03	1.29	1.46	1.22	......	1.9	2.3	2.45	1.28
30	0.99	0.73	1.12	1.08	1.32	1.38	1.19	......	1.85	2.1	2.25	1.19
31	0.98	0.73	......	2.15	......	1.45	1.08	......	2.0	......	2.05	......

NOTE.— Record began July 11, 1918.

Daily discharge, in second feet, of COHOCTON RIVER NEAR CAMPBELL, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	......	117	104	193	430	193	298	182	725	457	725	581
2	......	92	68	186	430	270	616	402	457	457	725	517
3	......	92	68	186	350	197	457	293	350	457	616	457
4	......	120	66	193	336	197	340	201	350	688	616	402
5	......	92	66	164	336	212	320	208	402	688	650	402
6	......	96	94	171	288	161	320	197	402	650	517	350
7	......	112	117	208	257	249	400	232	307	650	549	725
8	......	99	84	201	241	216	500	236	298	650	517	581
9	......	92	66	201	249	549	400	208	762	915	517	688
10	......	102	62	182	224	430	480	147	955	1,700	2,900	955
11	129	99	75	158	220	430	460	182	688	1,500	4,220	725
12	154	96	66	164	224	340	440	430	487	2,900	3,610	616
13	135	80	94	168	216	321	420	224	581	2,030	2,610	517
14	112	82	109	147	186	725	380	280	307	1,600	1,810	402
15	96	89	80	151	189	955	360	350	457	1,310	1,310	350
16	106	80	73	144	171	725	340	253	517	1,310	1,040	376
17	104	80	138	135	182	616	320	280	1,130	1,130	1,600	457
18	99	73	178	138	1,400	487	300	186	1,810	1,220	1,220	376
19	102	75	307	138	1,040	402	345	175	1,130	762	955	307
20	96	71	693	135	762	350	402	257	955	650	725	302
21	84	73	553	151	620	326	350	193	800	650	5,720	298
22	78	68	376	147	549	350	280	164	800	517	6,470	253
23	84	82	288	147	430	457	326	193	725	457	7,060	232
24	96	71	262	117	376	402	457	182	581	650	5,030	208
25	228	66	241	120	316	487	402	164	430	650	4,060	197
26	158	71	331	178	293	430	307	197	402	581	2,770	253
27	109	68	312	189	270	280	298	171	402	838	1,920	402
28	117	66	262	158	236	331	241	457	616	725	1,310	350
29	99	66	224	154	253	331	224	......	581	875	998	249
30	141	73	189	171	266	293	212	......	549	725	838	212
31	108	73	......	762	......	326	171	......	650	......	688	......
Mean	......	84.4	188	182	378	388	360	237	632	946	2,070	421

NOTE.— Stage-discharge relation probably affected by ice, January 5 to 18, inclusive.

Monthly discharge of COHOCTON RIVER NEAR CAMPBELL, for the year ended June 30, 1919

[Drainage area, 480 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
August	120	66	84.4	0.176	0.20
September	688	62	188	0.392	0.44
October	762	117	182	0.379	0.44
November	1,400	171	378	0.788	0.88
December	955	161	388	0.808	0.93
January	616	171	360	0.750	0.86
February	457	147	237	0.494	0.51
March	1,810	298	632	1.32	1.52
April	2,900	457	946	1.97	2.20
May	7,060	517	2,070	4.31	4.97
June	955	180	421	0.877	0.98

MUD CREEK, STEUBEN COUNTY

MUD CREEK AT SAVONA

Location.— On the farm of L. R. Travis in the town of Savona, Steuben county; about half a mile above the mouth.

Drainage area.— 80 square miles. (Furnished by Mr. Robert O. Hayt.)

Records available.— July 8, 1918, to June 30, 1919.

Gage.— Vertical staff secured to 8-inch by 8-inch timber planted in concrete at the water's edge on the left bank 150 feet upstream from farm bridge. Read by L. R. Travis.

Discharge measurements.— Made by wading at the gage or from farm bridge.

Channel and control.— Fairly well compacted gravel and not likely to shift. Considerable grass growth in stream bed. Control probably submerged by backwater from the Cohocton river during extreme floods.

Extremes of discharge.— Current year: Maximum stage recorded, 6.65 feet at 6:45 A. M., May 23; discharge, 852 second-feet. Minimum stage recorded, 3.38 feet at 7:15 P. M., October 19; discharge, 9.5 second-feet.

Ice.— Stage-discharge relation affected by ice.

Regulation.— Grist mills at Bradford, 7 miles upstream, cause some diurnal fluctuation in flow.

Accuracy.— Stage-discharge relation poorly defined; affected by ice from December to March and by aquatic growth from June to November.

Coöperation.— Station established by the Lamoka Electric Power Company under the direction of the United States Geological Survey. Maintained by the Survey in coöperation with the Power Co. and the State of New York.

Discharge measurements of MUD CREEK AT SAVONA, during the year ended June 30, 1919

Date	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft*
July 19	E. D. Burchard	3.53	18.4
Aug. 18	C. C. Covert	3.49	14.3
Nov. 21	E. D. Burchard	3.69	38.4
Nov. 21	E. D. Burchard	3.69	39.6
1919			
Jan. 27	E. D. Burchard	3.59	30.5
Apr. 4	J. W. Moulton	3.98	70.8
Apr. 13	M. H. Carson	4.88	212
Apr. 14	M. H. Carson	4.75	187
Apr. 15	M. H. Carson	4.65	170
Apr. 20	M. H. Carson	4.02	72.3
May 22	O. W. Hartwell	5.76	401
May 25	O. W. Hartwell	6.40	746
May 26	O. W. Hartwell	5.90	548

Daily gage height, in feet, of MUD CREEK AT SAVONA, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	......	3.54	3.60	3.57	3.63	3.52	3.66	3.58	3.76	3.86	4.0	3.92
2	......	3.52	3.46	3.52	3.62	3.54	3.86	3.62	3.56	3.91	3.94	3.94
3	......	3.50	3.48	3.50	3.58	3.62	3.78	3.57	3.56	3.84	3.92	3.94
4	......	3.58	3.53	3.58	3.51	3.58	3.78	3.55	3.58	3.94	3.92	3.89
5	......	3.54	3.50	3.48	3.56	3.54	3.70	3.54	3.67	4.0	3.98	3.92
6	......	3.58	3.48	3.48	3.51	3.51	3.60	3.54	3.65	3.92	3.92	3.86
7	......	3.56	3.50	3.52	3.50	3.66	3.58	3.56	3.65	3.90	3.88	4.45
8	3.54	3.52	3.52	3.49	3.48	3.58	3.62	3.50	3.55	3.92	3.90	4.1
9	3.56	3.54	3.47	3.45	3.48	3.68	3.66	3.52	4.05	4.00	4.05	4.1
10	3.63	3.62	3.48	3.43	3.51	3.58	3.58	3.52	4.35	4.35	5.2	4.25
11	3.59	3.52	3.47	3.50	3.51	3.55	3.61	3.52	3.94	5.0	5.6	4.5
12	3.66	3.50	3.47	3.58	3.52	3.66	3.53	3.54	3.84	5.1	5.8	4.35
13	3.60	3.50	3.58	3.56	3.46	3.64	3.58	3.48	3.84	4.9	5.8	4.1
14	3.62	3.62	3.48	3.42	3.47	3.81	3.64	3.58	3.69	4.75	5.4	3.94
15	3.54	3.51	3.42	3.44	3.45	3.95	3.71	3.62	3.64	4.65	4.6	3.85
16	3.54	3.60	3.40	3.45	3.42	3.87	3.60	3.54	3.98	4.65	4.25	3.95
17	3.54	3.63	3.50	3.40	3.49	3.74	3.62	3.57	4.4	4.65	4.4	4.0
18	3.54	3.50	3.59	3.44	4.25	3.65	3.65	3.54	4.45	4.5	4.35	3.83
19	3.52	3.48	3.47	3.41	4.0	3.61	3.64	3.48	4.1	4.4	4.15	3.71
20	3.58	3.50	4.25	3.44	3.80	3.57	3.62	3.56	4.05	4.0	3.95	3.72
21	3.56	3.52	4.05	3.39	3.71	3.62	3.62	3.52	4.05	4.1	5.1	3.64
22	3.50	3.52	3.70	3.50	3.65	3.67	3.62	3.52	4.7	4.0	5.5	3.64
23	3.51	3.66	3.55	3.41	3.65	3.76	3.67	3.54	4.6	3.96	6.6	3.61
24	3.72	3.48	3.56	3.42	3.60	3.72	3.76	3.52	4.25	4.05	6.3	3.58
25	4.05	3.46	3.56	3.42	3.58	3.70	3.70	3.54	3.86	3.98	6.4	3.58
26	3.76	3.47	3.76	3.48	3.60	3.72	3.62	3.53	3.75	4.0	5.9	3.68
27	3.60	3.60	3.68	3.48	3.60	3.62	3.64	3.57	3.85	3.96	5.1	3.74
28	3.54	3.49	3.59	3.40	3.52	3.62	3.60	3.61	4.1	4.0	4.5	3.66
29	3.52	3.50	3.57	3.50	3.58	3.65	1.60	......	3.98	4.0	4.2	3.62
30	3.62	3.50	3.48	3.52	3.61	3.62	3.60	......	3.96	3.96	4.0	3.56
31	3.62	3.48	......	4.00	......	3.64	3.52	......	4.0	......	3.96	......

NOTE.—Record began July 8, 1918.

Daily discharge, in second-feet, of MUD CREEK AT SAVONA, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	......	18	20	20	34	25	36	29	46	57	73	63
2	......	17	12	16	30	26	57	33	28	62	66	66
3	......	15	13	15	26	33	48	29	28	54	63	66
4	......	20	16	20	20	29	48	27	29	66	63	60
5	......	18	14	14	24	26	40	26	37	73	71	63
6	......	20	13	14	22	24	31	26	36	63	63	57
7	......	20	14	17	20	36	29	28	36	61	59	136
8	20	17	15	15	20	29	33	23	27	63	61	86
9	20	18	12	13	20	38	36	25	80	73	80	86
10	26	24	13	12	22	29	29	25	120	120	300	106
11	24	17	12	16	22	27	32	25	66	240	435	144
12	30	15	12	22	24	36	25	26	54	270	510	120
13	24	15	20	20	20	35	29	22	54	216	510	86
14	24	24	13	11	20	51	35	29	39	188	365	66
15	19	15	15	12	20	67	41	33	35	170	161	56
16	19	22	8	14	17	58	31	26	71	170	106	67
17	19	24	14	11	22	44	33	29	128	170	128	73
18	19	15	20	13	106	36	36	26	136	144	120	53
19	17	14	12	12	73	32	35	22	86	128	92	41
20	22	15	90	14	50	29	33	28	80	73	67	42
21	20	16	65	11	41	33	33	25	80	86	220	35
22	16	16	30	18	36	37	33	25	179	80	360	35
23	17	26	18	12	36	46	37	26	161	68	700	32
24	32	14	19	13	31	42	46	25	106	80	705	29
25	65	12	19	13	29	40	40	26	57	71	745	29
26	36	13	36	17	31	42	33	25	45	73	550	38
27	24	22	28	17	31	33	35	29	56	68	270	44
28	18	14	20	12	25	33	31	32	86	73	144	36
29	17	15	20	19	29	36	31	......	71	73	99	33
30	24	15	14	20	32	33	31	......	68	68	73	28
31	24	14	......	65	......	35	25	......	73	......	68	......
Mean	......	17.4	20.9	16.7	31.1	36.1	35.2	26.8	70.9	107	236	62.5

NOTE.— Stage-discharge relation affected by growth on control, October 1 to November 14; also by backwater from Cohocton river, May 21 to 23. Daily discharge for these periods is approximate.

Monthly discharge of MUD CREEK AT SAVONA, for the year ended June 30, 1919
[Drainage area, 80 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July	65	16	....	....	....
August	26	12	17.4	0.218	0.25
September	90	8	20.9	0.261	0.29
October	65	11	16.7	0.209	0.24
November	106	17	31.1	0.388	0.43
December	67	24	36.1	0.451	0.52
January	57	25	35.2	0.440	0.51
February	33	22	26.8	0.335	0.35
March	179	27	70.9	0.886	1.02
April	270	54	107	1.34	1.50
May	745	59	236	2.95	3.40
June	144	28	62.5	0.781	0.87

ALLEGHENY RIVER DRAINAGE BASIN

ALLEGHENY RIVER

DESCRIPTION

Allegheny river drains the western slopes of the Allegheny mountains in Pennsylvania and New York.

The river rises in the central part of Potter county, in northern Pennsylvania, flows in a general northwesterly direction into New York to about the central part of Cattaraugus county, where it turns and flows southwestward back into Pennsylvania. At Franklin, in Venango county, it turns and flows southeastward to the mouth of Mahoning creek, in Armstrong county, where it again bends to the southwest, and at Pittsburgh joins the Monongahela to form the Ohio. The river is about 290 miles long (map measurement) and its drainage area, which is nearly 50 per cent greater than that of the Monongahela, comprises about 11,100 square miles.

The noteworthy tributaries in New York are Oswayo, Olean and Tunugwant creeks. Oswayo and Tunugwant creeks rise in Pennsylvania. Two other important creeks — Conewango and Brokenstraw — have their sources in New York state, but are tributary to the main stream at points in Pennsylvania.

The elevation of the sources of the river is about 2,500 feet above sea-level. At Olean, N. Y., the elevation is 1,420 feet; at Franklin, Pa., the elevation is 960 feet; at Pittsburgh, Pa., the elevation is 692 feet.

The basin is somewhat regular in shape, being about 2½ times as long as it is wide. Its northwestern boundary is, at one point, about 8 miles from Lake Erie, lying within about 40 miles of Buffalo. Below Franklin, Pa., the river flows near the western boundary of its basin. The surrounding country is made up of high hills or mountains separated by deep valleys, but west of the main river the country is less mountainous, though the surface is still rolling and hilly.

The bed of the stream is composed chiefly of gravel, ranging in size from small pebbles to cobblestones. The banks are made up of sand, gravel or clay. The area is underlaid by shales and except in stream valleys the soil has little depth.

This basin is exceptionally rich in natural resources — coal, oil, gas, limestone, glass sand and building stones, which occur in abundance.

This basin was at one time covered with timber, the principal varieties being pine and hemlock. At present, however, only light forests and brush are found at the headwaters of the tributaries, the pine and hemlock having been cut off some time ago.

The mean annual rainfall in this region is about 40 inches and the winters are severe. Snowfall is heavy in the upper part of the basin and lasts for long periods, and ice forms to a thickness of about 2 feet. The heavy ice during the spring floods is very destructive. Jams frequently occur, which cause considerable damage from backwater.

Allegheny river is subject to very severe floods, which cause heavy losses to manufacturing and other interests along the river.

The fall of the main river and tributaries is comparatively large and if the stream were in a district where fuels were more expensive, it would undoubtedly be much used for power. When the price of coal advances, so that water-power can compete with steam, the water-power on this stream will be more extensively developed.

The Cuba reservoir, which feeds the Erie canal through Genesee river, lies on the divide between the Allegheny and Genesee drainage basins. Part of the overflow from this reservoir passes into the Allegheny and the rest into the Genesee.

ALLEGHENY RIVER AT RED HOUSE

Location.— At highway bridge in Red House, Cattaraugus county, about 5 miles below Salamanca and 13 miles above the boundary between New York and Pennsylvania. Conewango creek, the outlet of Chautauqua lake, enters the Allegheny in Pennsylvania about 30 miles below the station.

Drainage area.— 1,640 square miles.

Records available.— September 4, 1903, to June 30, 1919.

Gage.— Gurley 7-day graph water-stage recorder on the left bank just below the highway bridge, installed September 3, 1917; inspected by Mr. W. E. Coe.

Prior to this date chain gage attached to the upstream side of bridge near left end.

Discharge measurements.— Made from downstream side of bridge.

Channel and control.— Coarse gravel, occasionally shifting. Current good for medium and high stages, slow at low stages.

Extremes of discharge.— Current year: Maximum stage from water-stage recorder, 10.12 feet at noon, May 23; discharge, about 21,400 second-feet. Minimum stage from water-stage recorder, 3.09 feet at 5 P. M., July 24; discharge, 254 second-feet.

1903–1919: Maximum stage recorded, 12.7 feet, March 26, 1913; discharge, 40,000 second-feet. Minimum stage recorded, 2.7 feet on several days in December, 1908; discharge, about 100 second-feet.

Ice.— Stage-discharge relation somewhat affected by ice.

Regulation.— Low-water flow may be slightly affected by the operation of several small power-plants above Salamanca. A storage reservoir on the divide between Oil creek, tributary to Allegheny river, and Genesee river, tributary to Lake Ontario, was formerly used for supplying water to the Erie canal system through the abandoned Genesee River canal and the Genesee river. This reservoir is no longer used for canal purposes. Water is all turned into Allegheny through Olean creek.

Accuracy.— Stage-discharge relation practically permanent between dates of shifting. Affected by ice during a large part of the period from December to February, inclusive. Rating curve well defined between 300 and 900 second-feet and between 6,000 and 15,000 second-feet. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying mean daily gage height to rating table. Daily gage height obtained from automatic record by inspection. Results good except for periods when the stage-discharge relation was affected by ice, when results were fair.

Coöperation.— Station established and maintained by the United States Geological Survey in coöperation with the State Conservation Commission.

Discharge measurements of ALLEGHENY RIVER AT RED HOUSE, during the year ended June 30, 1919

DATE	Made by	Gage height	Discharge
1918		*Feet*	*Sec.-ft.*
Aug. 22	E. D. Burchard	3.22	408
1919			
April 18	M. H. Carson	6.01	5,570
May 17	J. W. Moulton	6.46	6,820
June 18	J. W. Moulton	3.77	905

Daily gage height, in feet, of ALLEGHENY RIVER AT RED HOUSE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	3.87	3.55	3.45	4.20	6.95	4.40	*a*	4.14	*a*	4.46	4.90	4.80
2	3.81	3.39	3.59	4.15	6.5	4.27	6.9	3.90	5.35	4.41	5.05	4.59
3	3.74	3.29	3.55	4.23	6.1	4.28	6.5	3.93	4.86	4.37	5.05	4.40
4	3.64	3.37	3.47	4.35	6.05	4.30	5.9	4.10	4.71	4.37	5.0	4.27
5	3.57	4.25	3.50	4.30	6.25	4.24	5.45	4.01	4.78	4.48	5.15	4.16
6	3.54	4.13	4.26	4.25	5.75	4.20	5.15	3.86	5.0	4.50	5.05	4.13
7	3.46	3.79	4.14	4.88	5.4	4.17	5.05	3.78	4.96	4.43	5.05	4.13
8	3.42	3.69	3.86	5.1	5.15	*a*	5.1	3.80	4.87	4.66	5.25	4.11
9	3.40	3.91	3.71	4.87	5.0	5.9	5.0	3.70	*a*	5.7	5.25	4.10
10	3.40	3.83	3.61	4.71	4.91	5.4	4.56	3.76	6.4	*a*	*a*	4.20
11	3.44	3.80	3.52	4.55	4.82	5.1	4.50	3.77	6.0	7.8	9.6	4.06
12	3.43	3.95	3.49	4.45	4.63	5.15	4.35	3.73	5.6	8.6	8.9	3.89
13	3.40	3.93	4.06	4.52	4.51	5.1	4.30	*a*	5.45	7.7	7.9	3.77
14	3.35	3.77	4.72	4.46	4.44	5.65	4.38	4.49	5.1	7.2	7.1	3.71
15	3.30	3.86	4.32	4.40	4.35	6.55	4.52	4.50	4.90	6.6	6.95	3.73
16	3.27	3.89	4.21	4.30	4.26	6.25	4.46	4.50	4.99	6.35	5.95	3.89
17	3.25	3.76	5.1	4.19	4.47	5.85	4.33	4.37	6.0	6.2	6.25	3.81
18	3.22	3.61	5.35	4.10	5.15	5.5	4.27	4.10	6.65	6.0	6.65	3.86
19	3.20	3.51	4.87	*a*	5.9	5.25	4.26	4.02	6.5	5.75	6.15	3.69
20	3.16	3.43	5.25	*a*	5.95	5.0	4.14	3.82	6.0	5.5	*a*	3.61
21	3.15	3.39	5.75	*a*	5.85	4.85	4.13	3.76	5.7	5.45	*a*	*a*
22	3.13	3.33	5.5	*a*	5.65	4.67	4.11	*a*	5.45	5.25	9.6	4.28
23	3.11	3.31	5.15	*a*	5.4	4.38	4.21	*a*	5.2	5.0	10.0	3.90
24	3.15	3.29	4.85	*a*	5.15	4.26	4.88	*a*	4.99	5.25	9.8	3.70
25	3.98	3.26	4.66	*a*	4.96	4.46	4.91	*a*	4.82	5.3	9.2	3.59
26	3.89	3.21	4.60	*a*	4.79	4.26	4.73	*a*	4.69	5.15	8.2	3.70
27	3.59	3.20	4.71	4.93	4.62	*a*	4.62	*a*	4.60	5.2	7.3	4.19
28	3.41	3.16	4.65	4.79	4.51	5.2	4.50	4.18	4.72	5.2	6.55	4.40
29	3.31	3.27	4.45	5.15	4.55	5.05	4.44	......	4.75	5.25	5.85	4.15
30	3.63	3.48	4.28	5.35	4.56	5.05	4.36	......	4.63	5.05	5.4	3.90
31	3.58	3.45	......	*a*	......	4.79	4.22	......	4.55	......	5.0	......

a No record.

Daily discharge, in second-feet, of ALLEGHENY RIVER AT RED HOUSE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1.....	992	635	538	1,460	8,070	1,770	3,750	1,370	3,230	1,870	2,680	2,480
2.....	918	481	675	1,380	6,690	1,560	7,910	1,030	3,660	1,790	2,980	2,090
3.....	836	392	635	1,500	5,560	1,580	6,690	1,070	2,600	1,720	2,980	1,770
4.....	727	463	556	1,690	5,420	1,610	5,030	1,310	2,310	1,720	2,880	1,560
5.....	655	1,540	585	1,610	5,970	1,520	3,900	1,180	2,440	1,910	3,200	1,400
6.....	625	1,360	1,550	1,540	4,640	1,460	3,200	980	2,880	1,940	2,980	1,360
7.....	547	894	1,370	2,640	3,780	1,420	2,980	882	2,800	1,820	2,980	1,360
8.....	509	780	980	3,090	3,200	2,390	3,090	905	2,620	2,220	3,420	1,320
9.....	490	1,040	802	2,620	2,880	5,030	2,880	790	4,030	4,520	3,420	1,310
10.....	490	942	696	2,310	2,700	3,780	2,040	859	6,400	7,030	10,400	1,460
11.....	528	905	605	2,020	2,520	3,090	1,940	870	5,290	11,000	18,800	1,250
12.....	518	1,100	576	1,860	2,160	3,200	1,690	824	4,270	14,100	15,400	1,020
13.....	490	1,070	1,250	1,970	1,960	3,090	1,610	1,070	3,900	10,600	11,400	870
14.....	445	870	2,330	1,870	1,840	4,400	1,740	1,920	3,090	8,900	8,560	802
15.....	400	980	1,640	1,770	1,690	6,840	1,970	1,940	2,680	6,990	8,070	824
16.....	378	1,020	1,480	1,610	1,550	5,970	1,870	1,940	2,860	6,260	5,160	1,020
17.....	362	859	3,090	1,440	1,890	4,900	1,660	1,720	5,29	5,830	5,970	918
18.....	340	696	3,660	1,310	3,200	4,020	1,560	1,310	7,140	5,290	7,140	980
19.....	325	595	2,620	1,300	5,030	3,420	1,550	1,190	6,690	4,640	5,700	780
20.....	299	518	3,420	1,300	5,160	2,880	1,370	930	5,290	4,020	5,650	696
21.....	292	481	4,640	1,500	4,900	2,580	1,360	859	4,520	3,900	13,200	1,910
22.....	280	427	4,020	1,500	4,400	2,240	1,320	900	3,900	3,420	18,800	1,580
23.....	266	409	3,200	1,400	3,780	1,740	1,480	950	3,310	2,880	20,800	1,030
24.....	292	392	2,580	1,400	3,200	1,550	2,640	1,000	2,860	3,420	19,800	790
25.....	1,140	370	2,220	1,300	2,800	1,870	2,700	1,100	2,520	3,540	16,800	675
26.....	1,020	382	2,110	2,000	2,460	1,550	2,350	1,000	2,270	3,200	12,500	790
27.....	675	325	2,310	2,740	2,150	2,680	2,150	1,100	2,110	3,310	9,250	1,440
28.....	500	299	2,200	2,460	1,960	3,310	1,940	1,430	2,330	3,310	6,840	1,770
29.....	409	378	1,860	3,200	2,020	2,980	1,840	......	2,380	3,420	4,900	1,380
30.....	716	566	1,580	3,660	2,040	2,980	1,710	......	2,160	2,980	3,780	1,030
31.....	665	538	......	8,040	......	2,460	1,490	......	2,020	......	2,880	......
Mean...	553	699	1,860	2,110	3,520	2,900	2,560	1,160	3,540	4,580	8,360	1,260

NOTE.— Daily discharge, October 19 to 26 and February 22 to 27, estimated, because of no gage height record, by comparing gage-height record with that of Cattaraugus creek at Versailles.

Monthly discharge of ALLEGHENY RIVER AT RED HOUSE, for the year ended June 30, 1919

[Drainage area, 1,640 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
July........................	1,140	266	553	0.337	0.39
August........................	1,540	299	699	0.426	0.49
September........................	4,640	538	1,860	1.13	1.26
October........................	8,040	1,300	2,110	1.29	1.49
November........................	8,070	1,550	3,520	2.15	2.40
December........................	6,840	1,420	2,900	1.77	2.04
January........................	7,910	1,320	2,560	1.56	1.80
February........................	1,940	790	1,160	0.708	0.74
March........................	7,140	2,020	3,540	2.16	2.49
April........................	14,100	1,720	4,580	2.79	3.11
May........................	20,800	2,680	8,360	5.10	5.88
June........................	2,480	675	1,260	0.768	0.86
The year........................	20,800	266	2,758	1.68	22.95

CHADAKOIN RIVER

DESCRIPTION

Chadakoin river is the outlet of Chautauqua lake. It follows a winding course for about 18 miles, having a general easterly direction, to its junction with Conewango creek, which rises in the northerly parts of Chautauqua and Cattaraugus counties and flows in a southerly direction, entering the Allegheny river in the state of Pennsylvania.

Chautauqua lake, about 16 miles long and 1 to 2 miles wide, occupies a deep valley in the highlands which rise abruptly a few miles to the southeast of Lake Erie. The surface of the lake is about 735 feet above Lake Erie and 1,308 feet above sea-level, while the surrounding hills rise 600 to 800 feet higher. There are numerous small streams entering the lake, of which Prendergast creek is the largest.

The principal tributary of Chadakoin river is Cassadaga creek, entering from the north about 4 miles below Jamestown. The river has a total fall of about 70 feet from the lake surface to its junction with Conewango creek.

CHADAKOIN RIVER AT BOAT LANDING, JAMESTOWN

Gage No. 226

This station, established July 31, 1915, is located opposite the boat landing at the Fairmount avenue bridge over Chadakoin river about 3 miles below the foot of Chautauqua lake. The gage, No. 226, is a staff having a range of 9 feet, between elevations 1,306.0 and 1,315.0 (U. S. G. S. datum), secured to a pile about 60 feet upstream from the Fairmount avenue bridge near the right bank of the stream. The gage is read once daily to tenths, with occasional readings to half-tenths.

Daily elevation of water-surface (U. S. G. S. datum) of CHADAKOIN RIVER AT BOAT LANDING, JAMESTOWN, for the year ended June 30, 1919.
Horace S. Butts, Observer

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	1,308.4	1,308.0	1,307.7	1,307.85	1,308.3	1,308.85	1,309.3	1,309.25	1,308.45	1,308.2	1,308.7
2	1,308.5	1,308.0	1,307.65	1,307.85	1,308.55	1,308.8	1,309.6	1,309.2	1,308.4	1,308.2	1,308.95
3	1,308.25	1,307.9	1,307.65	1,308.1	1,308.6	1,308.8	1,309.6	1,309.1	1,308.4	1,308.15	1,308.9
4	1,308.2	1,307.95	1,307.7	1,307.9	1,308.75	1,308.9	1,309.55	1,309.1	1,308.4	1,308.1	1,308.85
5	1,308.2	1,307.95	1,307.75	1,308.0	1,308.9	1,308.9	1,309.6	1,309.0	1,308.4	1,308.1	1,308.95
6	1,308.2	1,307.95	1,307.8	1,308.05	1,308.9	1,309.0	1,309.5	1,308.9	1,308.35	1,308.0	1,308.85
7	1,308.2	1,307.9	1,307.8	1,307.95	1,308.85	1,308.8	1,309.5	1,308.85	1,308.3	1,307.95	1,308 95
8	1,308.2	1,307.9	1,307.75	1,308.0	1,308.9	a	1,309.45	1,308.8	1,308.3	1,308.1	1,309.0
9	1,308.2	1,308.0	1,307.75	1,307.95	1,308.85	a	1,309.4	1,308.7	a	1,308.15	1,308.9
10	1,308.2	1,308.0	1,307.7	1,307.95	1,308.9	a	1,309.4	1,308.6	1,308.55	1,308.15	1,309.1
11	1,308.2	1,307.95	1,307.6	1,307.95	1,308.9	a	1,309.4	1,308.6	1,308.55	1,308.3	1,309.9
12	1,308.15	1,307.95	1,307.6	1,308.0	1,308.9	1,309.05	1,309.35	1,308.5	1,308.55	1,308.5	1,309.9
13	1,308.15	1,307.95	1,307.7	1,308.15	1,308.9	1,309.05	1,309.3	1,308.45	1,308.5	1,308.75	1,309.8
14	1,308.15	1,307.9	1,307.7	1,308.15	1,308.9	1,309.2	1,309.25	1,308.45	1,308.4	1,308.55	1,309.7
15	1,308.15	1,307.9	1,307.7	1,307.95	1,308.8	1,309.35	1,309.25	1,308.55	1,308.35	1,308.5	1,309.65
16	1,308.1	1,307.85	1,307.7	1,307.95	1,308.8	1,309.4	1,309.2	1,308.55	1,308.4	1,308.45	1,309.55
17	1,308.1	1,307.85	1,307.8	1,307.9	1,308.8	1,309.35	1,309.2	1,308.4	1,308.4	1,308.75	1,309.7
18	1,308.05	1,307.75	1,307.8	1,307.95	1,308.85	1,309.35	1,309.2	1,308.4	1,308.9	1,308.9	1,309.85
19	1,308.05	1,307.7	1,307.8	1,307.9	1,308.9	1,309.3	1,309.15	1,308.4	1,308.7	1,308.7	1,309.65
20	1,308.0	1,307.7	1,307.85	a	1,309.05	1,309.25	1,309.15	1,308.4	1,308.6	1,308.7	1,309.5
21	1,308.0	1,307.7	1,307.95	1,308.15	1,308.9	1,309.25	1,309.1	1,308.3	1,308.6	1,308.8	1,309.6
22	1,308.0	1,307.7	1,307.9	1,308.05	1,309.0	1,309.3	1,309.1	1,308.2	1,308.6	1,308.7	1,309.7
23	1,308.0	1,307.65	1,307.9	1,308.0	1,309.1	1,309.3	1,309.15	1,308.35	1,308.5	1,308.7	1,309.7
24	1,307.9	1,307.65	1,307.95	1,308.0	1,309.0	1,309.2	1,309.3	1,308.3	1,308.45	1,309.1	1,309.7
25	1,308.0	1,307.65	1,307.9	1,308.0	1,308.95	a	1,309.35	1,308.3	1,308.4	1,309.0	1,309.7
26	1,308.0	1,307.6	1,307.95	1,308.1	1,308.85	1,309.4	1,309.3	1,308.45	1,308.4	1,308.95	1,309.6
27	1,308.0	1,307.6	1,308.1	1,308.1	1,308.9	1,309.35	1,309.3	1,308.4	1,308.35	1,308.75	1,309.5
28	1,307.95	1,307.6	1,307.8	1,307.95	1,308.9	1,309.25	1,309.25	1,308.35	1,308.8	1,308.7	1,309.4
29	1,307.9	1,307.7	1,307.95	1,308.1	1,309.0	1,309.2	1,309.25	....	1,308.55	1,308.75	1,309.3
30	1,308.1	1,307.7	1,307.9	1,308.15	1,309.0	1,309.2	1,309.25	....	1,308.4	1,308.8	1,309.2
31	1,308.0	1,307.7	....	1,308.3	....	1,309.2	1,309.3	....	1,308.3	....	1,309.1

NOTE.—Station discontinued May 31, 1919. a No record.

CHADAKOIN RIVER AT WARNER DAM, JAMESTOWN

Gage No. 225

This station, established July 31, 1915, is located at Warner dam, Jamestown, about 4 miles below the foot of Chautauqua lake. The gage, No. 225, is a staff having a range of 16 feet, between elevations 1,304.0 and 1,320.0 (U. S. G. S. datum), secured to the second pile from the right bank of the river, about 30 feet upstream from the dam. The gage is read once daily to tenths, with occasional readings to half-tenths.

Daily elevation of water-surface (U. S. G. S. datum) of CHADAKOIN RIVER ABOVE WARNER DAM, JAMESTOWN, for the year ended June 30, 1919.
Horace S. Butts, Observer

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	1,307.25	1,306.9	1,307.0	1,307.1	1,307.15	1,307.0	1,307.3	1,307.6	1,307.4	1,307.95	1,308.55
2	1,307.25	1,306.9	1,307.0	1,307.0	1,307.15	1,307.15	1,307.95	1,307.45	1,307.4	1,308.1	1,308.4
3	1,307.5	1,306.95	1,307.0	1,307.1	1,307.05	1,307.2	1,307.9	1,307.6	1,307.5	1,307.9	1,308.45
4	1,307.4	1,306.9	1,306.95	1,307.0	1,307.3	1,307.3	1,307.7	1,307.8	1,307.25	1,307.8	1,308.35
5	1,307.25	1,306.9	1,307.2	1,307.3	1,307.2	1,307.2	1,307.85	1,307.8	1,307.5	1,307.8	1,308.4
6	1,307.15	1,306.9	1,307.15	1,307.4	1,307.2	1,307.2	1,307.65	1,307.5	1,307.45	1,307.95	1,308.25
7	1,306.9	1,306.9	1,306.95	1,307.2	1,307.1	1,307.25	1,307.55	1,307.3	1,307.45	1,307.95	1,308.4
8	1,307.2	1,306.85	1,307.1	1,307.0	1,307.3	a	1,307.6	1,307.25	1,307.4	1,307.85	1,308.3
9	1,307.2	1,307.0	1,307.0	1,307.1	1,307.15	a	1,307.4	1,307.25	a	1,307.95	1,308.25
10	1,307.2	1,307.0	1,307.0	1,307.0	1,307.4	a	1,307.4	1,307.4	1,307.8	1,307.9	1,308.35
11	1,307.2	1,307.0	1,306.8	1,307.1	1,307.3	a	1,307.4	1,307.4	1,307.65	1,308.2	1,308.7
12	1,307.1	1,307.0	1,306.8	1,307.0	1,307.1	1,307.3	1,307.4	1,307.4	1,307.6	1,308.3	1,308.5
13	1,307.15	1,306.9	1,307.0	1,307.4	1,307.1	1,307.3	1,307.2	1,307.45	1,307.35	1,308.55	1,308.5
14	1,307.0	1,306.8	1,306.9	1,307.2	1,307.1	1,307.3	1,307.2	1,307.4	1,307.5	1,308.4	1,308.5
15	1,307.0	1,306.8	1,306.8	1,306.7	1,307.2	1,307.8	1,307.2	1,307.35	1,307.3	1,308.3	1,308.45
16	1,306.9	1,306.8	1,306.9	1,306.8	1,307.15	1,307.6	1,307.4	1,307.25	1,307.2	1,308.25	1,308.4
17	1,306.9	1,306.7	1,307.0	1,306.8	1,307.2	1,307.55	1,307.3	1,307.4	1,307.4	1,308.4	1,308.6
18	1,306.9	1,306.5	1,307.0	1,306.8	1,307.3	1,307.55	1,307.3	1,307.5	1,307.6	1,308.5	1,308.65
19	1,306.95	1,306.4	1,307.1	1,306.75	1,307.15	1,307.4	1,307.2	1,307.3	1,307.6	1,308.2	1,308.4
20	1,306.8	1,307.0	1,307.1	a	1,307.3	1,307.4	1,307.35	1,307.4	1,307.5	1,308.5	1,308.2
21	1,306.9	1,306.9	1,307.15	1,307.0	1,307.2	1,307.35	1,307.35	1,307.35	1,307.5	1,308.45	1,308.3
22	1,306.8	1,306.9	1,307.1	1,306.95	1,307.2	1,307.55	1,307.35	1,307.4	1,307.4	1,308.45	1,308.4
23	1,307.0	1,306.7	1,307.0	1,307.0	1,307.3	1,307.5	1,307.4	1,307.35	1,307.25	1,308.4	1,308.4
24	1,306.9	1,306.7	1,307.2	1,306.95	1,307.2	1,307.2	1,307.3	1,307.4	1,307.35	1,308.4	1,308.4
25	1,306.9	1,306.9	1,307.1	1,306.95	1,307.2	a	1,307.2	1,307.9	1,307.4	1,308.1	1,308.4
26	1,307.0	1,306.85	1,307.3	1,307.0	1,307.1	1,307.6	1,307.2	1,307.35	1,307.95	1,308.0	1,308.3
27	1,307.05	1,306.85	1,307.4	1,306.3	1,307.3	1,307.3	1,307.1	1,307.25	1,307.95	1,307.9	1,308.3
28	1,307.0	1,306.8	1,307.0	1,306.95	1,306.9	1,307.35	1,308.0	1,307.2	1,308.0	1,307.95	1,308.2
29	1,306.9	1,307.2	1,307.2	1,306.8	1,307.35	1,307.3	1,307.55	....	1,307.8	1,308.4	1,308.2
30	1,307.1	1,307.1	1,307.1	1,306.8	1,307.3	1,307.2	1,307.7	....	1,307.45	1,308.4	1,308.1
31	1,307.2	1,307.2	....	1,306.7	....	1,307.2	1,307.7	....	1,307.75	....	1,308.0

NOTE.—Station discontinued May 31, 1919. a No record.

TABLE OF DISCHARGES PER SQUARE MILE

Summary of Discharge, in Second-feet per Square Mile, for all River Stations for which Data are Available in this Report

Station	Drainage area	1918 July	1918 Aug.	1918 Sept.	1918 Oct.	1918 Nov.	1918 Dec.	1919 Jan.	1919 Feb.	1919 Mar.	1919 April	1919 May	1919 June	Maintained by
ST. LAWRENCE RIVER BASIN	Sq. mi.													
Cattaraugus creek at Versailles	467	0.388	0.229	0.540	0.934	1.280	1.580	1.580	1.030	1.980	2.610	3.550	0.606	U. S. G. S.
Little Tonawanda creek at Linden	22	0.098	0.044	0.077	0.353	0.446	1.170	1.040	0.705	2.180	2.210	5.860	1.150	U. S. G. S.
Genesee river at Scio	208	0.384	0.357	1.020	0.802	1.850	1.090	1.160	0.622	1.690	2.830	5.350	0.882	U. S. G. S.
Genesee river at St. Helena	992	0.142	0.171	0.505	0.578	1.130	1.300	1.010	0.407	1.520	2.420	4.600	0.741	U. S. G. S.
Genesee river at Jones bridge, Mt. Morris	1,400	0.152	0.157	0.437	0.470	0.956	0.992	0.900	0.411	1.410	2.390	4.680	0.743	U. S. G. S.
Genesee river at Rochester	2,360	......	......	......	......	......	......	......	......	......	......	......	......	U. S. G. S.
Canaseraga creek near Dansville	167	......	......	......	......	......	......	......	......	1.880	3.770	......	......	U. S. G. S.
Canaseraga creek at Cumminsville	160	0.204	0.154	0.213	0.215	0.341	0.388	0.532	0.244	1.320	2.100	3.560	0.919	U. S. G. S.
Canaseraga creek at Groveland Station	184	0.203	0.151	0.214	0.333	0.471	0.718	0.668	0.321	1.160	1.900	3.730	0.930	U. S. G. S.
Keshequa creek at Craig Colony, Sonyea	69	0.077	0.047	0.086	0.183	0.224	0.343	0.363	0.159	0.714	1.370	3.190	0.490	U. S. G. S.
Canadice lake near Hemlock	12.6	0.280	0.221	0.172	0.144	0.172	0.193	0.428	1.244	1.343	1.282	3.877	0.681	R. C. E.
Oswego river at Minetto	5,091	0.609	0.371	0.556	0.889	1.045	0.998	0.911	0.767	1.277	1.971	2.272	1.123	S. E.
Oswego river at new High dam	5,097	0.840	0.621	0.784	1.266	1.516	1.438	1.285	1.073	1.728	2.640	2.890	1.528	S. E.
Owasco outlet near Auburn a	206	0.908	0.883	0.689	0.660	0.733	0.995	1.440	0.922	1.420	3.120	2.860	0.937	U. S. G. S.
Oneida river at Caughdenoy	1,377	0.710	0.447	0.582	1.857	2.311	2.348	1.646	1.397	2.119	3.176	3.281	1.512	S. E.
Black river near Boonville b	303	0.713	0.148	1.570	2.080	2.290	3.240	2.040	1.550	3.190	5.890	3.170	0.238	U. S. G. S.
Black river near Felts Mills	1,851	1.160	0.633	1.290	1.840	2.470	2.480	1.920	1.250	3.570	......	......	......	S. E.
Black river at Black River	1,870	1.100	0.620	1.090	1.940	2.550	2.110	1.840	0.920	3.350	5.060	2.890	0.829	U. S. G. S.
Moose river at Moose River	370	1.390	0.581	1.940	3.000	2.610	2.560	1.890	1.270	4.240	5.730	3.220	0.808	U. S. G. S.
Middle branch of Moose river at Old Forge c	51.5	1.700	1.400	1.960	4.200	3.030	1.820	1.140	1.210	2.450	4.270	1.040	0.736	U. S. G. S.
Beaver river at State dam near Beaver River d	176	1.350	1.350	1.180	1.380	2.700	2.370	1.700	1.600	2.380	5.910	3.140	1.320	U. S. G. S.
Oswegatchie river near Heuvelton	961	0.679	0.522	0.922	2.500	2.910	2.970	1.900	1.120	3.530	4.650	2.920	1.390	U. S. G. S.
East branch of Oswegatchie river at Newton Falls	166	1.490	1.960	2.040	2.400	2.300	2.750	2.460	1.880	1.980	5.410	3.220	1.770	U. S. G. S.
West branch of Oswegatchie river near Harrisville	245	0.910	0.429	1.230	3.000	3.750	3.160	1.670	1.050	3.780	5.020	2.790	0.980	U. S. G. S.
Raquette river at Piercefield e	723	1.550	0.874	0.697	2.720	3.170	2.090	1.600	0.896	1.670	5.340	3.980	1.480	U. S. G. S.
St. Regis river at Brasher Center	621	......	......	......	......	......	......	1.690	0.858	3.170	4.270	2.790	1.020	U. S. G. S.
Ausable river at Ausable Forks	444	0.806	1.380	1.800	3.690	2.550	2.160	1.100	0.689	3.060	4.120	3.780	1.250	U. S. G. S.
Saranac river near Plattsburg	607	1.010	0.878	1.310	2.540	2.540	1.880	1.380	0.931	2.360	3.330	2.720	1.290	U. S. G. S.
HUDSON RIVER BASIN														
Hudson river near Indian Lake	418	0.976	0.462	1.260	2.800	2.730	2.160	1.060	0.577	1.710	6.340	5.070	1.160	U. S. G. S.
Hudson river at North Creek	804	0.950	1.130	1.260	2.000	2.050	1.380	1.270	1.430	2.510	5.320	4.100	1.100	U. S. G. S.
Hudson river at Thurman	1,550	0.748	0.774	0.987	1.540	2.140	1.480	1.260	1.100	2.550	4.760	3.650	1.210	U. S. G. S.
Hudson river at Spier Falls	2,800	0.661	0.518	0.825	1.380	2.300	1.830	1.390	0.904	3.320	5.210	3.960	1.090	U. S. G. S.
Hudson river at Mechanicville, upper dam	4,500	0.513	0.327	0.606	1.100	1.960	1.810	1.450	0.762	2.440	3.420	2.930	0.907	W. Va. P. & P. C.

Hudson river at Mechanicville, lower dam	4,570	0.655	0.425	0.787	1.239	2.066	1.826	1.684	0.952	3.258	4.589	3.364	1.101	A. E. P. C.
Indian river near Indian Lake f	132	1.360	5.100	2.420	0.018	0.050	0.183	1.950	5.670	0.818	1.950	4.680	0.871	U. S. G. S.
Schroon river at Riverbank	534	0.410	0.311	0.492	1.220	2.380	1.600	1.380	0.826	2.280	5.190	3.240	1.190	U. S. G. S.
Sacandaga river near Hope	494	0.476	0.160	0.494	1.210	2.410	2.310	1.890	0.860	5.950	6.840	4.430	0.640	U. S. G. S.
Sacandaga river at Hadley	1,060	0.558	0.189	0.708	1.220	2.420	2.330	1.650	0.723	4.160	5.260	4.300	0.836	U. S. G. S.
Hoosic river near Eagle Bridge	512	0.459	0.236	0.844	1.090	1.480	2.210	2.050	0.973	3.730	3.340	3.400	0.766	U. S. G. S.
Hoosic river at Schaghticoke	635	0.362	0.146	0.509	0.898	1.107	1.106	1.310	0.620	2.685	2.592	4.885	0.676	S. P. C.
Mohawk river at Vischer Ferry dam	3,400	0.723	0.429	0.886	1.360	1.490	1.990	1.430	0.874	2.780	3.200	2.460	0.595	U. S. G. S.
Mohawk river at Crescent dam	3,490	0.716	0.395	0.897	1.240	1.450	1.930	1.400	0.817	2.810	3.270	2.540	0.645	U. S. G. S.
Schoharie creek at Prattsville	236	0.280	0.080	0.690	0.770	0.780	1.530	1.590	0.750	3.260	4.410	3.690	0.720	B. W. S.
Esopus creek at Coldbrook	192	0.450	0.170	0.690	0.700	0.970	2.410	1.830	0.920	4.860	4.490	4.680	1.030	B. W. S.
Rondout creek at Lackawack	100	0.490	0.220	1.030	1.230	1.430	3.160	2.450	1.350	4.130	3.380	3.290	1.040	B. W. S.
Rondout creek at Rosendale	386	0.390	0.160	0.600	0.650	0.990	2.630	2.120	......	......	......	......	......	B. W. S.
DELAWARE RIVER BASIN														
East branch of Delaware river at Fish Eddy	790	0.456	0.239	0.620	1.560	0.980	2.250	2.270	0.851	3.250	4.080	3.110	0.737	U. S. G. S.
Delaware river at Port Jervis	3,250	0.422	0.194	0.505	1.030	1.000	1.600	1.640	0.788	2.860	2.790	2.380	0.692	U. S. G. S.
Beaver kill at Cooks Falls	236	0.521	0.280	0.631	1.480	1.380	2.770	2.350	0.911	4.120	4.140	3.050	0.983	U. S. G. S.
West branch of Delaware river at Hale Eddy	611	0.599	0.172	1.010	1.920	1.630	1.700	1.870	0.910	2.860	3.130	2.270	0.386	U. S. G. S.
SUSQUEHANNA RIVER BASIN														
Susquehanna river at Conklin	2,350	0.596	0.238	0.744	1.360	1.750	1.760	1.750	0.834	2.450	2.630	2.210	0.451	U. S. G. S.
Chenango river near Chenango Forks	1,420	0.841	0.296	0.870	1.160	1.900	2.010	1.650	0.866	2.780	2.980	2.680	0.479	U. S. G. S.
Chemung river at Chemung	2,440	0.156	0.114	0.382	0.693	0.766	0.668	0.701	0.321	1.530	1.990	4.710	0.619	U. S. G. S.
Tioga river near Erwins	1,320	......	0.130	0.495	0.655	0.909	0.765	0.758	0.377	1.600	1.950	5.330	0.644	U. S. G. S.
Cohocton river near Savona	383	......	......	......	......	......	......	......	......	1.330	2.030	4.570	0.862	U. S. G. S.
Cohocton river near Campbell	480	......	0.176	0.392	0.379	0.788	0.808	0.750	0.494	1.320	1.970	4.310	0.877	U. S. G. S.
Mud creek at Savona	80	......	0.218	0.261	0.209	0.388	0.451	0.440	0.335	0.886	1.340	2.950	0.781	U. S. G. S.
ALLEGHENY RIVER BASIN														
Allegheny river at Red House	1,640	0.337	0.426	1.130	1.290	2.150	1.770	1.560	0.708	2.160	2.790	5.100	0.768	U. S. G. S.
				1916						1917				
West branch of Ausable river near Newman	116	1.410	0.478	0.659	0.831	1.010	1.210	......	......	......	......	2.250	2.600	U. S. G. S.
				1917						1918				
		......	......	......	1.700	0.940	0.556	......	......	......	......	......	......	
Beaver kill at Cooks Falls	236	3.470	2.650	0.996	3.060	2.140	0.975	0.780	1.770	6.020	5.170	1.750	1.060	U. S. G. S.

a An average flow of about 10 second-feet is pumped from Owasco lake for water-supply of city of Auburn. Proportion returning to stream above gaging station not known. *b* These figures do not include the total run-off above this station on account of diversion through Forestport feeder into Black River canal. *c* These figures indicate the flow of the river as regulated at Old Forge dam. *d* These figures indicate the flow of Beaver river, as regulated by the sluice-gates and logway at the dam. *e* These figures are not corrected for storage. *f* These figures indicate the flow of Indian river as regulated by the sluice-gates and logways at Indian lake dam. U. S. G. S.— United States Geological Survey. R. C. E.— Rochester City Engineer. S. E.— Department of New York State Engineer. W. Va. P. & P. C.— West Virginia Pulp and Paper Co. A. E. P. C.— Adirondack Electric Power Corporation. S. P. C.— Schenectady Power Company. B. W. S.— New York City Board of Water Supply.

CLIMATOLOGICAL DATA

On the following pages there are published certain records of precipitation at stations throughout the State maintained either by the Department of the State Engineer, by the United States Weather Bureau in coöperation with the Department of the State Engineer, by the Board of Water Supply of New York city, by the Department of the State Engineer in coöperation with the United States Geological Survey or by private corporations or individuals. In connection with each record acknowledgment is made when due.

These records are published under the general headings of St. Lawrence River Drainage Basin and Hudson River Drainage Basin. Under these general heads are grouped the stations on the watersheds of the various streams of the two large drainage basins. The order of arrangement is similar to that of the stream gaging stations.

Stations maintained by the Board of Water Supply are located in territory adjacent to present or possible future sources of water-supply for New York city and are given under the headings "Catskill Watersheds," and "Watersheds at Large," and show monthly totals only.

The precipitation given under any date is the amount occurring during the twenty-four hours ending at 8 A. M. of that date. Precipitation records here given are not intended to embrace all data available, but only such data collected wholly or in part by the State of New York or that is available through the efforts of others than the United States Weather Bureau, whose publications should be consulted in connection with any study made of rainfall or run-off.

ST. LAWRENCE RIVER DRAINAGE BASIN

LITTLE TONAWANDA CREEK WATERSHED

Daily precipitation, in inches, at LINDEN, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1			0.38		0.07	0.34		†0.04	0.45	*0.10	0.15	
2					0.02		0.15				0.05	
3						0.02	†0.19					
4					0.19	0.12				0.09	0.09	
5		0.10	0.35		0.06	0.16				0.03	0.44	0.46
6			0.60	0.64		0.32			0.28			0.(5
7				0.45						0.20	0.07	0.53
8					0.02		†0.05	†0.09		0.10		0.39
9		0.80					†0.10	†0.11	0.42	0.35	0.14	0.61
10			0.02		0.09		†0.09	†0.03	0.18	0.22	0.50	
11						0.26				0.18	0.11	
12		0.06	0.04	0.14		0.02			0.10	0.38	0.15	
13			0.70	0.05	0.01	0.05				0.06	0.07	
14			0.06	0.13		0.16		0.17				
15		0.01		0.06		0.16		0.18				
16			0.31					†0.13	0.46	0.48		
17			0.76		0.02				0.32	0.05	0.41	0.22
18				T	0.16			†0.16	0.15	0.07	0.04	
19			0.17		0.27							
20			0.62	0.27	0.05							
21				0.37	0.10			†0.14			0.12	0.19
22		0.99			T	0.16		†0.10			0.11	
23					0.03		0.04	0.11			0.05	
24			0.45				0.23			0.48	0.11	
25		0.05				0.59				*0.14		
26			0.33	0.22	T			†0.12		0.22		0.47
27				T								0.17
28			T						0.35			
29		0.30	0.03	0.18	0.18					0.21		
30			0.09	0.02	0.04		†0.06					
31		0.02		0.47		0.13						

† Melted snow. * Snow. T means trace.

NOTE.— Rain gage established August 1, 1918; maintained by State Engineer in coöperation with United States Geological Survey.

OAK ORCHARD CREEK WATERSHED

Daily precipitation, in inches, at MEDINA, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	DAY	July	Aug.	Sept.	Oct.	Nov.
1	0.23					16			0.40		
2				0.30		17					0.38
3					0.54	18			0.10		0.70
4					0.14	19			0.64		
5			1.27			20				0.54	0.18
6				0.20		21		0.35			
7		0.10				22					
8						23			0.62		
9	0.23	0.43			0.19	24		0.35			
10						25				0.70	
11			0.04			26			0.14		
12			0.41	0.20		27					
13			0.05			28				0.31	0.15
14				0.50		29	0.47	0.22			
15			0.04			30	0.52			0.50	
						31		0.44			

NOTE.— Maintained by State Engineer in coöperation with United States Geological Survey.

CLYDE RIVER WATERSHED

Daily precipitation, in inches, at CLYDE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.83		0.43					*0.50			0.11	
2				0.09			0.30				0.48	
3				0.25	0.04		*3.00					
4	0.29		0.02		0.20	0.18		0.04		0.12		
5		0.33	1.04	0.02		*0.50				0.02	0.20	
6				0.57		*6.00	*T		*1.75			
7		0.07					*T			0.39	0.15	0.13
8	0.02	0.30								0.40		
9	0.17	0.60					*T	*T	0.63		0.18	0.88
10	0.14				0.11		*0.75		0.06	0.67	0.68	1.75
11	1.45					0.21				0.52	0.98	
12		0.05	0.42	0.07						0.71	0.17	
13			0.50			0.30					0.02	
14				0.09		0.13		0.31		0.01		
15				0.05		0.22	*T	0.04				
16			0.27					*T	0.50	0.10		
17	0.42		0.75		0.04				0.37	0.08	0.84	1.57
18					1.07			*0.25	0.21			
19			0.22		0.18			*T		0.05		
20			0.97	0.63	0.10						T	
21			0.17	0.35	0.10					0.08	0.83	
22			0.15		0.05	0.51		*1.50			0.28	
23						0.02					0.70	
24			0.54							0.80	0.34	
25	0.10		0.04	0.13		0.38				*0.50	0.14	
26				0.90						*2.50		0.36
27			0.24						0.18			1.42
28						*0.25			‡2.90	0.07		
29		0.18	0.05		0.10					0.25		
30	0.44		0.03	0.19			*1.50					
31		0.08		0.51		*0.25	*2.50		*T			

* Snow. ‡ 2.50 snow; 0.40 rain. T means trace.

Daily precipitation, in inches, at MAYS POINT, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.32		0.57					*0.50	0.23		0.06	
2	T			0.09		T	0.10				0.32	
3		0.13		0.44	0.04	T	*5.00					
4	0.32				0.29	0.16				0.10	0.10	
5		0.25	0.08	0.02				0.08				
6			0.59	0.53		*5.50			§*2.12			0.16
7		0.04								0.34	0.17	T
8		0.26								0.15		1.47
9	T	0.62								0.25	0.20	0.54
10	0.34	T	0.01		0.09		*1.00		0.70	0.27	0.50	T
11	0.40					0.08				0.21	0.96	
12	T	0.03	0.31			0.25				1.09	0.10	
13			0.52	0.07							0.30	
14			0.06			0.23		0.25				
15				0.16		0.22					T	
16			0.24					0.08	0.22	0.08		0.06
17	0.42		1.01		0.04				0.42	0.16	0.52	
18	T			0.06	1.57				0.12	0.05	0.27	
19			0.20		0.20			†0.01				
20			0.94									0.01

Daily precipitation, in inches, at MAYS POINT, for the year ended June 30, 1919 — *Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
21			0.04	0.68	0.10					0.04	0.50	
22			0.08			0.20		†0.20			0.05	
23			0.44			0.23		0.12			1.15	
24							0.30	0.02		0.78	0.18	
25	0.92	0.11		0.15		0.29				*T	0.18	0.23
26				0.96		0.10		0.23		†0.11		1.52
27		0.06	0.22									
28	1.47		0.01						§*6.55			
29		0.28		0.03			0.03			0.26		
30	0.80		0.07		0.04		*2.00					
31		0.14		0.61			*2.50					

* Snow. † Melted snow. §* Rain and snow. T means trace.

GANARGUA CREEK WATERSHED

Daily precipitation, in inches, at MACEDON, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.44		0.28			*0.50	0.11	*T	0.28	*1.00	0.13	
2				0.06	0.04		0.05				0.38	
3		0.20		0.30	0.03	*T	*3.50					
4	0.37		0.02	0.01	0.28	0.08				0.15	0.07	
5		0.12	0.20	0.02	0.01	*0.62	*T	0.13		0.03	0.28	
6			0.57	0.66		*4.50	*T		§*2.51		0.05	
7		0.30		0.30		*1.25				0.18	0.10	0.03
8	0.04	0.24						*T		0.11		0.18
9	0.10	0.67			0.04		*T	*2.75	0.47	0.42	0.08	1.15
10	0.43				T		*3.00	*3.50	0.20	0.23	0.52	
11						0.20				0.33	0.95	
12		0.02	0.15	0.15		0.13				0.87	0.40	
13			0.35	0.05	0.01					0.01	0.17	
14	0.03			0.07		0.16		0.29		0.05		
15				0.45		0.12		0.11				
16	0.32		0.17			0.01	*0.75	§*1.37	0.20	0.15	0.02	
17	T		0.67		0.01				0.37	0.09	0.47	1.05
18			0.03	0.07	0.52			*0.75	0.02	0.01	0.01	
19			0.10		0.14			*0.75				
20			0.65	0.05	0.04			*T	T			
21				0.62	0.08			*0.38		0.09	1.22	0.12
22			0.04		0.12	0.20		*1.75	0.01		0.23	
23					0.01	0.06	0.01	0.06		0.01	0.63	
24	0.01		0.42				0.20			0.60	0.57	
25	0.02	0.01		0.02		0.40				§*2.03	0.04	
26				0.37	0.01	0.03		0.08		*2.25		0.50
27		0.19	0.10	0.01		*T			0.03			0.37
28	0.30		T			*0.38			§*4.20			
29	0.13	0.18	0.02	0.23	0.01	*T	T			0.17		
30	0.70	0.02	0.05	0.05		*T	*T					
31		0.06		0.41		*0.31	*0.75					

* Snow. §* Rain and snow. T means trace.

Daily precipitation, in inches, at NEWARK, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.35		0.45			*0.38	0.10		0.30	†0.03	0.15	
2				0.08			0.07				0.49	
3		0.12		0.22	0.07		*2.50					
4	0.37		T		0.31	0.10				0.09	0.02	
5		0.13	0.05			0.01		0.08		0.03	0.29	
6			0.45	0.65		*5.50			*1.75		T	T
7		0.04		0.25		*T				0.25	0.08	0.05
8		0.27								[illegible]	0.02	
9	0.07	0.64			0.01			*0.25	0.36	0.43	0.14	1.34
10	0.20		T				†0.03	*1.50	0.23	0.35	0.56	0.03
11	0.21					0.11				0.29	1.10	
12	0.20	0.01	0.21	0.11		0.14				0.97	0.07	
13			0.34								0.27	
14				0.15	0.09	0.04		0.25		0.02		
15				0.24		0.18		0.06				
16			0.21				*T	0.16	0.03	0.09		
17	0.62		0.57		T				0.48	0.08	0.38	0.50
18			T	0.05	0.62			*0.50	0.06	T	0.12	
19			0.34		0.10							
20			0.69		0.12							T
21			0.01	0.77	0.08			*T		0.09	0.95	0.11
22			0.07		0.05	0.28		*0.50			0.31	
23						0.09		0.05			0.43	
24			0.45							0.82	0.45	
25	0.08			0.09		0.15				0.02	0.16	
26				0.39					0.12	*1.66		0.41
27		0.06	0.16					*0.50				1.57
28						*T			0.35			
29	0.05	0.12	0.02	0.14	0.05		†0.01			0.21		
30	0.22	0.01	0.05	0.08			*0.50					
31		0.07		0.43		0.01	†0.02					

*Snow. † Melted snow. T means trace.

SENECA RIVER WATERSHED

Daily precipitation, in inches, at BALDWINSVILLE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.25				0.06							
2		T			0.45		*0.21				1.20	
3	0.12					*0.12						
4		0.05		0.32	0.20					0.08		
5			0.35		T					0.04	0.15	
6						*0.29						
7											0.08	
8		1.16										
9	0.18		T		0.08				*0.50	0.06	0.58	
10							*0.50		*0.65	0.47	0.85	0.30
11						*0.40				0.82	0.40	
12			0.18	0.43							0.10	
13			0.26	0.32		*0.28		*0.84				
14				0.28	0.06							
15						*0.26						
16			1.11						*0.75	0.49		0.60
17	0.60		0.05		1.20						0.95	
18			0.65		0.12							
19			0.62		T							0.20
20			0.08	0.58	0.10					0.12	0.70	

Daily precipitation, in inches, at BALDWINSVILLE, for the year ended June 30, 1919 —*Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
21											0.16	
22			T		0.40	*0.27		*0.26			1.10	
23					0.08					0.74	0.10	
24			0.65			*0.20	*0.80				0.20	
25				0.91	0.09	*0.23						
26		T		0.08								
27	0.76		0.21									0.60
28		0.25	0.06		0.06			*0.55	*0.45	0.33		
29	0.65			0.10		*0.21						
30		T		0.68	0.05							
31		0.34		T								

* Snow. T means trace.

ONEIDA RIVER WATERSHED

Daily precipitation, in inches, at LOCK No. 22, NEAR NEW LONDON, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1		0.02		0.02			0.10		0.22			
2					0.14						2.00	
3			0.03	0.46	0.20	*0.38					0.03	
4		0.15		0.01	0.19	*0.62				0.06	0.04	
5					0.08	*0.38		0.10			0.04	
6		0.07	1.18	0.55		*4.00	*4.00	†0.01	0.18			0.80
7		0.50		0.05						0.03	0.25	
8										0.48		0.09
9		1.21					*2.25		0.10	0.38	0.0[illegible]	0.04
10		0.14			*0.21				0.57	0.21	0.11	
11			0.09				*0.75		0.60	0.47	0.55	
12			0.60			*0.50				0.64	0.39	
13		0.05	0.90	0.01						0.04		
14			0.05	0.12	0.07	0.39		0.02				
15				0.07		0.21		0.45				
16			0.09						0.09			1.30
17			1.20						0.46	0.43	0.52	0.18
18			0.04		0.60					0.10	0.77	
19			0.52		0.45				0.11			0.07
20			0.65								0.35	0.48
21		0.66	0.25	1.38	0.02					0.23		
22			0.15		0.04	0.88		†0.03			0.49	
23			0.04				0.55				0.33	
24		0.03	0.52			§*0.56				0.51	0.18	
25			0.02			§*0.29				0.06	0.17	0.57
26			0.05	1.55		*0.50		0.60				0.22
27			0.17	0.01						0.02	0.07	0.68
28			0.02						0.45			
29		0.63	0.07	0.02	0.17	*2.00	*1.75			0.20		
30			0.02	0.30	0.02							
31		0.41		0.87		*1.00						

* Snow. §* Rain and snow. † Melted snow.

BLACK RIVER WATERSHED

Daily precipitation, in inches, at BOONVILLE, for the year ended June 30, 1919

DAY	July	Aug	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.76					*1.10	0.27		0.82		0.05	
2				0.06			0.38				0.95	
3			0.11	0.32			*0.46					
4						*0.22	*0.31			0.20	0.35	
5		0.12	0.64							0.12		
6			0.50	0.88		*0.55		*0.72	*0.14			0.10
7		0.07						*0.78		0.10	0.35	
8		0.13				0.06	*0.41					
9	0.15	0.81					*0.31		0.32	0.55		
10							*0.24		0.94		0.13	
11	0.18						*0.23		*0.33	0.60	0.65	
12	1.79		0.93							1.13		
13	0.39		1.01	0.25						0.08	0.27	
14	0.52	0.22		0.07		0.74		1.03		0.17		
15	0.11			0.04		0.31						0.13
16			0.28						0.07			0.15
17	0.66		2.00						0.14	0.25	1.40	
18			0.78						0.60	0.10	0.49	
19			0.02									
20			0.70	0.91								0.25
21				0.21						0.10	0.42	0 14
22			0.70			0.34		*0.75			0.10	
23			0.33			0.92		*0.35			0.41	
24			0.31				1.07	*0.26		0.80	0.34	
25				0.29		1.02					0.57	
26			0.39	0.82				‡0.80		*0.05		0.60
27			0.12					*0.32	1.00			0.73
28												
29		0.53	0.10							0.20		
30	0.76		0.03	0.45		*0.18			*0.12			
31		1.24		0.68			*0.12		1.00			

* Snow. ‡ Snow 0.41; rain 0.39.

WOOD CREEK WATERSHED

Daily precipitation, in inches, at SMITH'S BASIN, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.05		2.10	0.10			§*0.55		0.55			
2	0.26				0.03		0.29				0.82	
3	0.02	0.05		0.14		*0.25	*4.00				0.01	
4				0.01	0.01	*1.00				0.10	0.02	
5					0.25	*0.50				0.03	0. 9	
6	0.07		0.22	0.63		*2.00			0.10			
7	1.21	0.16				*0.12						0.40
8	0.07						*1.50				0.43	0.02
9		0.97	0.50		0.02				0.53	0.20	0.05	0.35
10	0.51	0.35			0.04		*0.75		0.82			1.11
11	0.36	0.08								0.26	0.14	
12			0.08			*1.50			*0.25	0.72	0.01	
13	0.01			0.04							0.07	
14	0.14		0.72	0.08		0.26		0.22				
15	0.02	0.82				0.15		0.44				0.06
16	0.01		0.06					*0.12	0.24	0.07		0.34
17	0.65		0.30						0.42	0.57	0.54	
18	0.09		0.06		0.55				0.12	0.04	0.50	
19			0.44		2.17				0.06	0.02		
20			0.19		0.03				0.01			

Daily precipitation, in inches, at SMITH'S BASIN, for the year ended June 30, 1919—*Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
21			0.82	0.35	0.03						0.03	
22								*2.00			1.06	
23						0.78		*3.25			0.14	
24			0.28				1.16				0.07	
25		0.07	0.02			§*1.45				0.25	0.16	
26			1.44	0.36		0.03		*3.75			0.33	
27			0.95	0.04		*0.25						0.08
28			0.01	0.01		*0.12			§*2.02			0.28
29		0.20			0.44		*0.75		*2.00	0.16		
30	0.16	0.02		0.22	0.01							
31				0.83		*0.50			*0.25			

* Snow. §* Rain and snow.

Daily precipitation, in inches, at WHITEHALL, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.11		1.35						0.57			
2	0.02								0.05		0.74	
3		0.05		0.30							T	
4										0.03	T	
5			0.01	0.60						0.06	0.51	
6	0.06		0.17	0.30						T	0.01	
7			0.03						*T	T		0.27
8	0.18								*T	T	0.32	0.09
9	0.01	1.13	0.06						0.15	0.18	0.04	0.22
10	0.20								1.09		0.03	0.70
11	0.05									0.27	0.11	
12	0.01	0.30	0.05						0.02	0.97	0.03	
13	0.04		0.27							T	0.02	
14	0.09		0.26	0.25								
15	0.01	0.31										0.20
16			0.03						0.09	0.04		0.84
17	0.33		0.43						0.36	0.48	0.51	0.07
18	0.04		0.05	0.07					0.14	0.08	0.78	
19			0.46						T		T	
20	0.15		0.22									
21			0.72	0.34								0.04
22			0.03								1.45	
23											0.34	
24		0.02									T	T
25										0.11	0.17	
26		0.02		0.27						*0.50	0.14	T
27				0.03								1.24
28									1.15			0.39
29	0.58	0.11							§*5.45	0.18		
30	0.15			0.46					*T	0.01		
31				1.00					*0.50			

* Snow. §* Rain and snow. T means trace.
NOTE.— No records, September 23 to 30 and November 1 to February 28.

HUDSON RIVER DRAINAGE BASIN

HUDSON RIVER WATERSHED

Daily precipitation, in inches, at CORINTH, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1				0.6			0.32		0.35			
2	0.42		1.40				0.25				1.11	
3				0.12			*0.38					
4						*0.25						
5					0.35						0.33	
6			0.22	0.42		*0.40			*0.30			
7	0.06		0.15									
8	0.68						*0.22				0.40	
9		0.66	0.05						0.40	0.40	0.08	
10	0.40	0.35			0.12				1.00			
11		0.20								0.32	0.28	
12			0.15			*0.22				0.92	0.08	
13	0.20		0.45								0.30	
14			0.25	0.15		0.22		*0.20				
15	0.18	0.07	0.05			0.15		0.60				
16									*0.12			
17			0.45						0.48	0.82	0.60	
18	0.30				0.82				0.14		0.20	
19			0.55		0.85							
20			0.15									
21			0.75	0.72	0.30							
22								*0.35			1.00	
23						0.82		*0.62			0.82	
24							0.98				0.18	
25			0.16			0.91				0.55	0.30	
26			1.35	0.25				*0.92				
27			1.25			*0.08						
28									*1.60			
29		0.35		0.35	0.40		*0.05		*0.20	0.12		
30	0.18			0.35								
31				1.12								

* Snow.

NOTE.— Station maintained by U. S. Weather Bureau in coöperation with the State Engineer. No record for June.

Daily precipitation, in inches, at GLENS FALLS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1			1.46				0.14		0.41		0.93	
2	0.22						0.40					
3				0.22			*0.46				0.03	
4						*0.25	*0.12			0.06	0.23	
5			0.25		0.34							
6			0.02	0.55		*0.37			0.37			
7	0.20										0.34	0.42
8	0.26											0.13
9		0.75	0.05		0.06		0.06		0.15	0.27	0.06	0.48
10	0.34	0.16			0.11				1.40		0.03	0.09
11		0.09								0.22	0.25	
12			0.16			*0.23			0.03	0.92	0.03	
13	0.63		0.32									
14	0.78		0.36	0.19		0.25						
15		0.08				0.08		*0.92				0.21

Daily precipitation, in inches, at GLENS FALLS, for the year ended June 30, 1919 — *Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
16			0.09							0.12	0.53	0.39
17	0.82		0.15						0.55	0.70	0.35	
18	0.20		0.05		0.60					0.02		
19			0.50		1.22							
20			0.10								0.08	
21			0.68	0.42	0.11						1.05	
22								*0.28			0.43	
23						0.70					0.04	
24			0.20				1.01	*0.60			0.20	
25			0.11			*0.97				0.52	0.00	0.16
26			1.74	0.09		0.03		*0.75				
27			0.77	0.24								0.29
28												0.17
29		0.28			0.41	0.03	*0.06		*1.56	0.13		
30		0.21		0.22								
31				0.67								

* Snow.
NOTE.— Station maintained by the U. S. Weather Bureau in coöperation with the State Engineer.

Daily precipitation, in inches, at SCHUYLERVILLE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.58		0.22				0.66		0.68		0.60	
2	0.01					*0.38					0.28	
3							*5.00				0.01	
4					0.45	*0.25	*2.50			0.04	0.73	
5		0.10			T	*2.00						
6	0.17		0.12						0.10			0.44
7	0.21	0.02			0.02					0.08	0.59	
8	0.01		0.05			0.01	*1.00					T
9	0.26	0.74			0.18				1.15	0.17	0.13	1.45
10	0.09	0.04			0.02		*0.75			0.09	0.20	
11	0.62	0.09				*0.50						
12	0.01		0.07							0.85	0.04	
13	0.24		0.61			0.32				0.01		
14	0.11	0.02				0.13		§*1.08				0.01
15												0.40
16			0.07						0.57			
17	0.35		0.23		0.40					0.64	1.00	
18			0.58		1.30				0.20		T	
19	0.01				0.01							
20			0.70		0.04							0.01
21			0.36		0.10			*3.25		0.01	0.60	
22					0.01	1.07					0.94	
23			0.01				1.30	*1.25			0.05	T
24		0.25	0.38							0.88	0.07	
25		0.14	0.02			0.83					0.48	
26			2.70					0.82		*0.88		0.06
27			0.01			*0.12						0.18
28	0.02				0.20				0.77			T
29		0.62			0.08	*0.12	*0.38		*5.50			
30	0.40		0.67		T				*0.50			
31		1.00				*0.62			*2.00			

* Snow. §* Rain and snow. T means trace.
NOTE.— Station maintained by the U. S. Weather Bureau in coöperation with the State Engineer.

Daily precipitation, in inches, at MECHANICVILLE, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1			1.35	0.12			0.33		0.64			
2	0.84						0.20		0.03		0.69	
3				0.15			*0.32					
4					0.03		*0.03			0.03	0.10	
5					0.43	*0.02					0.51	
6	0.02		0.10	0.39		*0.29			*0.10			
7	0.18	0.22	0.03			*0.01					0.05	0.09
8	0.59									0.15	0.25	
9		0.28	0.04		0.01				0.07	0.20	0 15	0.03
10	0.02	0.50			0.10				0.59		0.04	0.50
11	0.05	0.37								0.11	0.36	
12	0.67		0.04			*0.23				1.02	0.01	
13			0.27	.08							0.17	
14	0.04		0.07	0.11		0.27		0.15				
15	0.07	0.11				0.20		0.39				
16			0.02						0.08	0.01		0.17
17	0.03		0.13						0.41	0.48	0.32	
18	0.07		0.03		0.46				0.12	0.01	0.76	
19			0.90		2.17							
20			0.22									
21			1.03	0.46	0.01					0.01		0.03
22								*0.26			0.89	
23						0.66		*0.53			0.30	
24			0.19				0.64				0.11	
25		0.73	0.10			0.29				0.32	0.07	
26			1.37	0.17		0.16		0.62		*0.02	0.15	0.01
27			0.82	0.29							0.02	0.13
28			0.01						*1.65			0.14
29		0.38		0.02	0.04				*0.10	0.04		
30	0.13	0.11		0.22								
31									*0.03			

* Snow.

NOTE.— Station maintained by the U. S. Weather Bureau in coöperation with the State Engineer.

Daily precipitation, in inches, at TROY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1						0.03					0.05	
2											0.27	
3												
4						0.01				0.01	0.67	
5		0.18							0.04		0.11	
6			0.32			0.36					0.06	0 08
7		0.05	0.01							0.03	0.08	
8			0.07						0.20	0.09	0 12	0.04
9		0.74							0.47		0.08	0 11
10										0.14	0.23	
11						0.29				0.74	0.33	
12		0.50				0.29				0.02	0.14	
13			.51			0.02						
14						0.36						0.15
15		0.16				0.27			0.10	0.01		0.12
16			0.02						0.60	0.34	0.20	
17			0.01						0.01		0.72	
18			0.26							0.03		
19			0.65									
20			0.26							0 01		

Daily precipitation, in inches, at TROY, for the year ended June 30, 1919—*Continued*

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
21			0.26								0.73	
22			0.03								0.81	
23						0.42					0.05	
24		0.12	0.26							0.18	0.12	
25						0.59				0.04	0.02	
26		0.86	1.45			0.07						
27			0.74						1.78			0.31
28									0.27	0.02		
29		0.32								0.01		
30		0.01							0.07			
31		1.95							0.02			

NOTE.—Station maintained by the U. S. Weather Bureau in coöperation with the State Engineer. No record for July, October, November, January and February.

SACANDAGA RIVER WATERSHED

Daily precipitation, in inches, at NORTHVILLE, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1			1.37			*0.12	*0.30					
2	0.62						0.39					
3				0.32		*0.06	*0.30					
4						*0.25	*0.10					
5		0.08			0.06					0.12		
6	0.12		0.52	0.51		*0.36			0.29			
7	0.19											
8							*0.18					
9		1.10					*0.04		0.57	0.28		
10	0.25				0.18				1.0			
11		0.24								0.49		
12			0.14			*0.22				0.80		
13	0.28		0.20									
14	0.75			0.08		0.29		0.22				
15		0.45	0.36			0.11		*1.05				
16			0.03							0.10		
17			0.43						0.65	0.45		
18	0.38				0.99				0.19			
19			0.51		0.52							
20	0.18		0.15						0.14			
21			0.53	1.11								
22						0.14		*0.30				
23						1.06		*0.48				
24			0.17				0.75			0.18		
25	0.10		0.05			1.10				0.31		
26			1.34	0.21				*0.90				
27			0.94	0.06								
28						0.04			*1.26			
29		0.38			0.32	0.03	*0.10		*0.10	0.21		
30	0.08			0.53	0.05							
31				1.51								

*Snow.

NOTE.—Station maintained by U. S. Weather Bureau in coöperation with the State Engineer. No record for May and June.

HOOSICK RIVER WATERSHED

Daily precipitation, in inches, at HOOSICK FALLS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1							0.09		0.68			
2				0.19		*0.06	0.53		[illegible]		0.53	
3				0.21			*0.68					
4					0.40		*0.04			0.13	0.05	
5					0.28	*0.03	*0.03			0.02	0.63	
6				0.22		*0.25			0.10		0.01	
7				0.08		*0.02						0.04
8										0.11	0.36	
9						*0.12	*0.02		0.06	0.16	0.06	0.01
10					0.10		*0.12		0.39		0.04	0.60
11										0.15	0.20	
12										0.86	[illegible]	
13				0.13						0.04	0.11	
14				0.20		0.56				0.01		0.04
15												0.18
16								*0.34	0.03			0.05
17									0.14	0.23	0.15	
18					0.28				0.04	0.02	0.90	0.01
19					0.80				0.11	0.01	0.02	
20					0.02							
21				0.22	0.08							0.02
22								*0.22			0.75	
23						0.38		*0.11			0.10	
24							0.56	0.02			0.06	
25						0.40				0.15	0.12	
26				0.12		0.12		0.68		*0.02	0.21	
27				0.18						0.03	0.02	0.40
28									1.54			0.32
29									0.73	0.01		
30				0.11					0.03	0.01		
31				0.43								

* Snow.

☞ NOTE.— Station maintained by the U. S. Weather Bureau in coöperation with the State Engineer. No record for July, August and September.

MOHAWK RIVER WATERSHED

Daily precipitation, in inches, at DELTA DAM, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.55		0.79	0.06		†0.20	0.15		0.34			
2				0.04	0.31		0.25				1.47	
3		0.03		0.31	0.08	†0.02	†0.35				0.01	
4	0.28		0.07		0.20	†0.20	†0.10			0.07	0.03	
5		0.10	0.19		0.15		†0.05	†0.12		0.02	0.19	
6			1.35	0.61		†0.30		†0.02	†0.35			0.13
7	0.02	0.52						†0.07		0.18	0.24	
8		0.11					†0.21			0.12	0.06	
9	0.16	1.33					†0.15	†T	0.29	0.42	0.05	
10	0.36	T			0.25		†0.04		0.69	0.20		
11	0.33	0.04			0.03	0.38			†0.17	0.43	0.93	
12			0.68							0.85	0.11	
13			1.12	T						0.06	0.24	
14	0.14		0.15	0.16	0.08	†0.34		0.47		0.01		
15	0.13			0.07		†0.26		0.23				

Daily precipitation, in inches, at DELTA DAM, for the year ended June 30, 1919—*Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
16			0.17					†T	0.07			
17	0.15		1.12		0.02				0.49	0.31	1.52	0.02
18	0.16		0.05		0.78				0.16	0.04	0.70	0.11
19			0.37		0.29		†T				0.01	
20			0.55		0.04				0.01			0.07
21			0.08	1.68	0.02					0.14	0.10	
22		0.11	0.11			0.27		†0.11				
23						0.45		†0.20			0.38	
24	0.06		0.40				0.37			0.67	0.32	
25	0.11					0.44	†T			0.08	0.14	
26			0.18	1.24		0.16		0.98		†0.04	0.27	1.18
27		T	0.34	0.03		*T		†0.02				0.62
28						*T	†0.04		0.65			
29		0.56	0.07	0.04	0.21		†0.08			0.20		
30	0.41		0.02	0.44	0.14	†0.07						
31				0.84		†0.06	†T		†0.01			

* Snow. † Melted snow. T means trace.
NOTE.— Station maintained by the U. S. Weather Bureau in coöperation with the State Engineer

Daily precipitation, in inches, at ADREAN RESERVOIR, NEAR UTICA, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.88		0.92	0.09	0.08	*0.08	0.21	*0.02	0.35		0.48	
2	0.40						0.38				0.08	
3	0.08	0.06		0.56	0.16	*0.02	*0.45					
4	0.27		0.02		0.05	0.12	*0.11			0.07	0.30	
5		1.02		0.42	0.18	*0.14	*0.04	0.08		0.08	0.06	
6			0.84	0.07		*0.10		*0.02	*0.38		0.02	0.21
7		0.18				*0.02		*0.02		0.18	0.46	0.03
8		0.40					*0.02			0.10	0.14	
9	0.12	0.40					*0.01		0.04	0.32	0.12	0.02
10	0.27	0.48			0.22		*0.11		*1.10	0.20	0.94	0.05
11	0.06	0.11				*0.05			0.11	0.43	0.14	
12	0.02		0.15			0.38				0.78	0.18	
13			0.78							0.11		
14			0.04	0.21	0.27	0.57						
15	0.10	0 05		0.14		0.15		0.54	0.04			0.03
16			0.06					*0.02		0.09		
17	0.20		0.56						0.60	0.24	0.09	
18	0.09		0.15		0.50				0.08	0.06	0.46	
19	0.12		0.19		0.05		0.02		0.08	0.02	0.06	
20			0.48		0.15							0.58
21			0.32	0.34	0.07				0.02	0.15		0.08
22		0.09	0 21	0.04	0.15	0.08		*0.18				
23			0.07		0.15	0.37		*0.05			0.14	
24		0.34	0.42				0.31	*0.03		0.21	0.20	
25			0.08			0.43		0.35		0.15	0.06	
26			0.48	0.50	*0.04	0.27		*0.02		*0.07	0.19	0.19
27			0.08	0.04		*0.13				0.08		0.44
28			0.16			*0.04			0.54			0.25
29		0.15	0.05		0.11		*0.12		*0.03	0.21		
30	0.44			0.60	0.05	*0.12	*0.02		*0.02			
31	0.15			0.82		*0.05	*0.12		*0.04			

* Snow.
NOTE.— Data supplied by Robert E. Horton.

Daily precipitation, in inches, at DEERFIELD RESERVOIR, UTICA, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.78		0.85	0.08	0.05	*0.03	0.20		0.25			
2	0.38				0.09		0.40				0.62	
3		0.04		0.57	0.07	*0.02	*0.33				0.03	
4	0.22		0.09		0.04	*0.14	*0.12			0.07		
5		0.37		0.64	0.23	*0.10	*0.06	*0.03		0.18	0.20	
6			0.97	0.06		*0.15		*0.02	*0.45		0.02	0.14
7		0.54						*0.02		0.14	0.04	0.07
8		0.23			0.02		*0.05	*0.01		0 25	0.40	
9	0.17	0 97					*0.08		*0.22	0.34	0.08	0.03
10	0.70	0.48			0.16		*0.05		*0.30	0.20	0 09	
11	0.32	0.06			0.03	*0.04			*0.15	0. 0	0.81	
12	0.01		0.44			0.16				0.70	0.10	0.03
13	0.02		0.78							0.06	0.19	
14	0.11		0.03	0.36	0.07	0.42		0.20		0.07		
15	0.13			0.13		0.17		0.35	0.04			
16			0.27					*0.03				
17	0.25		0 80						0.32	0.28	0.08	
18	0.08		0.10		0.55				0.07	0.06	0.63	
19			0.33		0.06				0.03	0.03	0.07	
20			0.46		0.12							0.11
21			0.23	1.29	0.03					0.18		0.14
22		0.06	0.19		0.04	0.32		*0.05				
23			0.09		*0.04	0.53		*0.05			0.10	
24			0.38				0.44			0.22	0.10	
25			0.06			0.51	0.01	0.45		0.14	0.09	
26			0.27	0.77	*0.02	*0.30				*0.03	0.33	0.32
27			0.14	0.03		*0.02				0.04	0.04	0.92
28			0.08			*0.03			0.95			
29		0.22			0.13		*0.13					
30	0.36			0.56	0.04	*0.07	*0.01			0.19		
31	0.05			0.87		*0.03	*0.03		*0.04			

* Snow.
NOTE — Data supplied by Robert E. Horton.

Daily precipitation, in inches, at GRAEFENBURG (RESERVOIR No. 1), NEAR UTICA, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec	Jan.	Feb.	Mar.	April	May	June
1	0.65		0.90	0.08		*0.03	0.12		0.55		0.20	
2	0.35						0.35				0.06	
3				0.55			*0.33				0.03	
4	0.25					*0.03	*0.08				0.30	
5		0.90		0.35	0.18	*0.05		0.12		0.04		
6			0.60	0.06		*0.18			*0.18			0.05
7		0.30				*0.03		*0.04		0.10		
8		0.40					*0.05			0.11	0.09	
9	0.15	0.30					*0.05			0.10		
10	0.15	0.40	0.03		0.18		*0.05		0.17			0.03
11	0.18	0.12								0.40	0.75	
12						0.06				0.52	0.10	
13			0.90							0.10	0.15	
14				0.20	0.03	0.90		0.06		0.06		
15	0.15	0.20		0.15		0.15		0.40				

Daily precipitation, in inches, at GRAEFENBURG (RESERVOIR NO. 1), NEAR UTICA, for the year ended June 30, 1919 — *Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
16	.....	.....	0.02	.....	.....	.....	.....	.....	.....	0.05	.....	.....
17	0.15	.....	0.40	.....	.....	.....	.....	*0.03	0.30	0.30	.....	.....
18	0.18	.....	0.15	.....	0.50	.....	.....	.....	0.07	0.05	0.50	.....
19	.....	.....	0.16	.....	0.05	.....	.....	.....	0.02	.....	.....	.....
20	.....	.....	0.30	.....	0.08	.....	.....	.....	.....	.....	.....	0.10
21	.....	.....	0.45	.....	*0.02	.....	.....	.....	.....	0.12	.....	0.60
22	.....	0.05	0.20	.....	0.12	.....	.....	*0.10	.....	.....	.....	.....
23	.....	.....	.....	.....	0.10	0.20	.....	*0.08	.....	.....	0.12	.....
24	.....	0.05	0.30	.....	.....	.....	0.20	.....	.....	0.10	0.20	.....
25	.....	.....	0.10	.....	.....	0.35	0.02	0.30	.....	0.20	0.05	.....
26	.....	.....	0.40	.....	*0.02	0.15	.....	*0.04	.....	*0.08	0.30	0.15
27	.....	.....	0.15	.....	.....	*0.02	.....	.....	.....	0.06	.....	0.05
28	.....	.....	0.15	.....	.....	.....	.....	.....	0.50	.....	.....	0.52
29	.....	0.07	.....	.....	0.06	*0.10	.....	.....	0.10	0.12	.....	.....
30	0.40	.....	.....	.....	0.02	*0.05	*0.02	.....	*0.05	.....	.....	.....
31	0.10	.....	.....	.....	.....	.....	*0.06	.....	*0.02	.....	.....	.....

* Snow.
NOTE.— Data supplied by Robert E. Horton.

Daily precipitation, in inches, at GENESEE ST. BRIDGE, UTICA, for the year ended June 30, 1919

DAY	Dec.	Jan.	Feb.	Mar.	DAY	Dec.	Jan.	Feb.	Mar.
1	*0.06	0.16	.....	0.30	16	.....	.....	*0.03	0.07
2	*0.10	0.32	.....	.....	17	.....	.....	.....	0.27
3	.....	*0.30	.....	.....	18	.....	.....	.....	0.05
4	.....	*0.20	.....	.....	19	.....	.....	.....	.....
5	*0.06	*0.09	0.01	.....	20	.....	.....	.....	0.05
6	*0.22	.....	*0.03	*0.28	21	.....	.....	.....	.....
7	*0.10	.....	*0.02	.....	22	0.06	.....	*0.13	.....
8	.....	*0.02	.....	.....	23	0.19	.....	*0.05	.....
9	.....	*0.04	.....	*0.23	24	.....	*0.16	0.04	.....
10	.....	*0.14	.....	*0.40	25	0.28	*0.02	.....	.....
11	.....	.....	.....	0.04	26	*0.06	.....	*0.22	.....
12	*0.01	.....	.....	0.01	27	*0.05	.....	*0.01	.....
13	.....	.....	.....	.....	28	*0.01	.....	.....	*0.98
14	0.22	.....	0.11	.....	29	.....	*0.12	.....	*0.05
15	0.11	.....	0.17	.....	30	*0.08	.....	.....	*0.02
					31	*0.02	*0.06	.....	*0.06

* Snow.
NOTE.— Station maintained by U. S. Weather Bureau in coöperation with the State Engineer.
No record for July, August, September, October, November, April, May and June.

Daily precipitation, in inches, at CANAJOHARIE, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.53		0.81	0.17	T	†0.02	0.27		0.11		0.02	
2				0.01	0.03		0.36				0.21	
3		0.01		0.20	T	†0.01	*5.50				T	
4	0.10				0.06	0.03	†0.03			0.04	0.04	
5		0.79	0.01	T	0.03		†0.01	†T	†0.02		0.38	
6		T	0.16	0.26	T	†0.10					T	0.12
7		0.56			T			*0.88		0.25	0.30	
8		0.02					*1.00			0.03	0.01	
9	0.03	0.76	T				†T		0.39	0.26	0.24	0.38
10	0.26	T	T	T	0.08		†T		0.14	0.21	0.07	0.01
11	0.24	0.32			0.01	0.07			†T	0.10	0.43	T
12	T		0.08	0.01	T	†0.09				0.57	0.15	
13	0.18		0.36	0.04	T	†0.02				0.01	0.23	
14	0.58			T	0.03	0.40		0.53		T		
15	0.21	0.48	T	0.03		0.09		0.16				0.08
16	T		0.02						0.17	0.16		0.06
17	0.27		0.33		0.05	T	†T		0.18	0.20	0.10	0.03
18	0.02		0.03		0.68				0.07	0.01	0.15	
19			0.25		0.09					0.04	T	
20			0.31		0.09	T			0.07			0.19
21			0.53	0.14	0.01			†T		0.06	0.02	0.14
22		T	0.01	0.03	T	0.06		†0.04			0.10	
23				T	T	0.10		†0.05			0.29	
24			0.35	T			0.43			0.18	0.32	
25		0.12	T			0.83				0.04	0.28	
26		0.01	1.64	0.47		†0.02		*0.70		†T	0.07	0.06
27			0.24	T		†T			T			0.09
28			T	T		†0.01			†0.57			
29		0.48		T	0.06		0.02		*T	0.19		T
30	0.07	T	T	0.16	T	†0.02						
31				1.62		†0.02	†T					

† Melted snow. * Snow. T means trace.

Daily precipitation, in inches, at TRIBES HILL, for the year ended June 30, 1919

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1			1.30				0.50		0.20			
2	0.50						0.40				0.47	
3				0.37		*0.10				0.20		
4	0.10						*0.50					
5		0.35									0.60	
6			0.10			*0.30						
7		0.15		0.30						1.23		
8											0.40	
9							*0.15		0.90	0.20		0.50
10	0.15	1.45									0.20	0.40
11										0.20		
12										0.63	0.44	0.40
13											0.43	
14	0.20	0.40	0.56			0.90						
15	0.35					0.40		0.95				0.90
16										0.18		0.90
17	0.31		0.46						*0.90	0.30		
18	0.29								0.15		0.32	
19			0.42		0.78							
20												

Daily precipitation, in inches, at TRIBES HILL, for the year ended June 30, 1919—*Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
21			0.70	0.60								0.10
22						0.30		*0.30			0.24	
23						0.90					0.32	
24							1.40				0.23	
25		0.60	0.40							*0.40	0.20	
26						0.80		0.70			1.10	0.15
27			1.80	0.78								
28												0.92
29		0.40							*1.20	0.25		
30	0.31	0.30			0.15							
31				1.12		*0.05	*0.10					

* Snow.
NOTE.— Station maintained by the U. S. Weather Bureau in coöperation with the State Engineer

Daily precipitation, in inches, at SCOTIA, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	0.25								0.35		0.75	
2				0.18		*0.25						
3	0.05					*T	*5.00					
4		0.30			0.20		*T			0.04		
5				0.29		*5.50			0.06		0.54	
6	0.11	0.01	0.18									0.13
7										0.21		
8		0.26					*1.00					
9	0.08	0.52	0.02		0.15				0.78		0.52	0.28
10	0.15	0.49								0.39	0.58	0.43
11	0.02	0.02								0.59	0.13	
12			0.65	0.04							0.54	
13	0.03		0.07			0.47				0.07		
14	0.05	0.21				0.10		0.53				
15												1.28
16									0.88	0.68	0.11	T
17	0.54		0.17		0.32						0.24	
18	0.10		0.36		0.37				0.19		T	
19					0.16							0.08
20			0.85	0.78						0.08	0.20	
21								*3.50			0.15	
22						0.09					0.38	
23								0.32			T	
24		0.44	0.26				0.12			0.36	0.06	
25			1.29			0.40		0.41			0.33	
26			0.60	0.42		*T						0.07
27			0.08						0.72			0.38
28	0.95				0.05	*T	*T		*3.50	0.12		
29	0.05	0.69										
30			0.09	0.15	*T							
31		1.01		0.20		*T	*T		*T			

* Snow.   T means trace.

WEST CANADA CREEK WATERSHED

Daily precipitation, in inches, at HOFFMEISTER, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	T				0.26		0.43				0.09	
2	T	T		0.52	0.16	*T						
3			T	T			*6.00			0.13		
4		0.08			*T	**5.00	*1.00	*T		0.17		
5			1.12	0.82		*3.00		*2.50	0.31		0.28	
6	§§1.00			T								T
7	T	0.05						**2.00		§§0.20	0.43	
8	0.17	0.60				0.06		*T		0.43		
9	0.46	T			T		**10.00		*4.00		T	0.18
10	0.03	0.34			0.61				*2.00	0.77		
11	0.22					*0.50				1.28	§§0.89	
12	0.02		0.69	T							0.23	
13	0.52		0.14	T						0.30		
14	0.43			0.35	0.63	T		*4.00				
15	T			T	*T			*T				T
16	0.40							*T	0.65	0.55	T	
17	T		§§0.72		0.22		*T			0.03		
18			0.30						0.38	0.08	§§1.61	
19					T				0.04			
20				1.24						0.08		0.38
21			§§0.85	T				*1.50			0.05	
22			0.24			0.50					0.12	
23			0.69								0.63	
24			T			0.78	§§0.95	**5.00		0.51	T	
25			T	1.00	*2.00						0.16	
26		T		T		**2.00		**8.00		*1.00	0.02	3.22
27			§§1.08			*T	*2.00	*T	0.83			T
28		0.34	T	0.06		*T	*2.00			0.24		
29	T	T		T	*e* 0.75	*3.00	*T		**3.00	*T		
30	0.62		0.20	1.71	*6.50		*T					
31		1.38				*1.00	*T		*T			

§§ Rain, including preceding day. * Snow. *e* Estimated. ** Snow, including preceding day. T means trace.

Daily precipitation, in inches, at HINCKLEY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	1.87		1.65			†0.37			1.10			
2					0.19		†0.58					
3				0.48			†0.28					
4			0.13			†0.30	†0.13				0.06	
5		0.13									0.26	
6			1.44	0.93								
7				0.12				†0.15		0.18		
8							†0.13					
9	0.25	1.12								0.56		0.17
10	0.90				0.42		†0.17		0.98		0.07	
11									†0.12	0.84	0.66	
12			0.48			†0.32				0.88	0.09	
13	0.57		0.91							0.12	0.17	
14	0.60		0.23	0.29		0.35		†1.68		0.07		
15	0.06					0.40						
16			0.12									
17	0.52		0.88						0.74	0.44		
18	0.47				0.75					0.04		
19			0.87		0.22							
20			0.37		0.07							0.49

Daily precipitation, in inches, at HINCKLEY, for the year ended June 30, 1919—*Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
21			0.25							0.13		
22				1.74								
23						2.05					0.46	
24			0.42				0.67			0.55	0.34	
25						0.98		†0.55		0.15		
26			0.35	1.26		0.33					0.30	0.37
27			0.12								0.03	2.00
28			0.11						0.65			
29		0.43	0.04	0.06						0.22		
30	0.37	0.15			0.67		†0.10		†0.03			
31				0.47								

† Melted snow.

Daily precipitation, in inches, at GRAY, for the year 1912

DAY	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.18	0.03		0.54		0.01		0.15	0.08	0.13		
2	0.04			0.55					0.77	0.40	0.36	
3		0.08		0.37		0.71		1.68	0.53			0.94
4								0.03		0.28		
5	0.08			0.04		0.02	0.39	0.06		0.01		
6					0.46			0.03	0.84			0.66
7		0.04			0.21	0.24	0.04		0.21		0.59	0.05
8		0.13		0.70							2.01	0.02
9	0.10		0.19		0.01		0.21				0.12	0.02
10	0.01			0.19	0.12			0.12		0.17	0.03	
11								0.70	0.06	0.46		
12					0.02			0.07	0.34	0.04		0.02
13			0.40		0.12	0.14				0.21	0.09	0.10
14				0.15	0.29		0.60				0.49	0.02
15	0.11		0.33	0.18	0.04			0.17	0.12		0.13	
16	0.06		0.71	0.10		0.22	0.70		0.91	0.07		0.27
17					0.67	0.05						
18	0.11			0.16	0.22			0.24				
19	0.76	0.15		0.43			0.12	0.11	0.49	1.06		0.84
20	0.03	0.70	0.07	0.04	0.04	0.02	0.02		0.15	0.23		0.15
21	0.07		0.15		1.17	0.02	0.01		0.04			0.05
22	0.02	0.75	0.11		0.52		0.80	0.40				
23	0.26	0.05		0.83				0.10				
24	0.15	0.07	0.32	0.02				0.20	0.88	0.62		0.05
25	0.02		0.20	0.28				0.09	0.65	0.81	0.93	0.11
26		0.81							0.33	0.19	0.05	
27	0.08	0.84	0.11	0.20				0.47	0.09	0.08		
28		0.01		0.04								0.16
29	0.18		0.47		0.10		0.06					0.05
30	0.19		0.49	0.28	1.78		0.09		0.38		0.03	0.08
31					0.16							0.77

NOTE.— Record for this year not published heretofore; data supplied by Robert E. Horton.

Daily precipitation, in inches, at GRAY, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	1.14		1.41			0.23	0.05		0.61			
2	0.88				0.18		0.87				0.51	
3		0.05		0.62			0.10				0.05	
4			0.10		0.03	0.29	0.10			0.10	0.06	
5		0.13			0.20	0.02	0.05			0.19	0.28	
6			1.01	0.92		0.38		0.12	0.31			
7		0.13		0.0[illegible]						0.13		
8		0.07					0.25			0.11	0.43	
9	0.18	1.47				0.07	0.20		0.02	0.44		0.05
10	0.70	0.19			0.35		0.05		0.79		0.10	0.11
11		0.08							0.12	0.67	0.72	
12			0.30							0.73	0.04	
13	0.24		0.61							0.12	0.24	
14	0.07		0.13	0.10		0.27				0.13		
15	0.14					0.04		0.95				
16			0.25					0.05				
17	0.28		0.67					0.02	0.55	0.40	0.52	0.90
18	0.20		0.08		0.78		0.05		0.27		0.70	
19			0.34		0.22				0.17			
20			0.29		0.12							
21			0.40	1.51	0.0[illegible]					0.09	0.08	0.29
22		0.10	0.10		0.01	0.06		0.17			0.09	
23			0.03			1.01		0.25			0.28	
24			0.46				0.67				0.09	
25			0.02			0.83	0.01			0.40	0.26	
26			0.62	0.96		0.27		0.91			0.27	0.39
27			0.33			0.02		0.05				1.37
28			0.04						0.97			
29		0.40	0.05		0.45		0.12		0.04	0.38		
30	0.31			0.66	0.07	0.02			0.02			
31	0.19			1.06								

NOTE.— Data supplied by Robert E. Horton.

Daily precipitation, in inches, at TRENTON FALLS, for the year ended June 30, 1919

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	1.04		1.27				0.26		0.54			
2	0.30			0.57		*0.28	0.25				0.84	
3		0.09		0.02			*0.35					
4			0.04			*0.28	*0.32			0.06		
5		0.19	0.50		0.04	*0.09	0.04	0.04		0.08	0.10	
6			0.48	0.80		*0.29		0.02	0.30			
7		0.25		0.15				0.07		0.18	0.46	0.08
8		0.50					*0.30			0.10		
9	0.65	1.02				0.07	*0.10		0.40	0.38	0.32	0.29
10	0.25	0.32			0.27		0.05		*0.25			
11	0.15				0.11	0.02			*0.15	0.68	0.42	
12			0.55			*0.27			0.15	0.82	0.20	
13			0.80							0.10	0.28	
14	0.23		0.15	0.42	0.09	0.25		0.34		0.05		
15	0.32			0.05		0.35		0.45				
16			0.38									
17			0.75					0.03	0.45	0.38	0.83	0.08
18	0.33		0.40		0.68				0.40	0.06	0.38	
19			0.35		0.15						0.16	
20			0.52		0.03							

Daily precipitation, in inches, at TRENTON FALLS, for the year ended June 30, 1919 —*Continued*

DAY	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
21	......	......	0.05	1.17	0.03	......	......	......	......	0.18	0.10	0.26
22	......	......	0.13	......	0.07	0.20	......	0.10	......	......	0.09	......
23	......	......	......	......	......	1.43	......	*0.11	......	......	0.08	......
24	......	......	0.18	......	0.02	......	0.56	0.05	......	0.10	0.32	......
25	......	......	0.10	......	......	0.73	......	......	......	0.51	0.39	......
26	......	......	0.18	1.02	*0.07	0.25	......	0.53	......	*0.03	0.20	0.48
27	......	......	0.17	0.10	0.06	0.05	......	......	......	0.07	0.18	1.77
28	......	......	0.05	......	......	0.05	0.08	......	0.95	......	......	......
29	0.06	0.43	0.07	......	0.70	......	0.07	......	0.01	0.25	......	......
30	0.11	......	......	0.60	0.06	*0.05	......	......	......	......	......	......
31	0.11	......	......	0.30	......	0.05	0.04	......	0.07	......	......	......

* Snow.
NOTE.— Station maintained by U. S. Weather Bureau in coöperation with the State Engineer.

CATSKILL WATERSHEDS

Stations maintained by the Board of Water Supply of New York city.

Monthly rainfall, in inches, on CATSKILL WATERSHEDS, for the year ended June 30, 1919

STATION	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
ESOPUS CREEK												
Phoenicia	3.18	2.09	7.32	2.57	1.81	3.34	1.97	2.21	6.65	3.16	6.84	4.33
Slide Mountain	3.79	2.03	7.68	4.27	1.91	3.93	3.81	2.49	6.96	4.03	5.56	4.68
Highmount	3.07	2.80	6.82	3.42	1.22	2.37	1.91	1.73	4.54	3.07	4.03	2.63
Edgewood	4.45	2.36	5.95	2.86	2.41	2.66	1.64	2.34	5.85	3.13	6.70	6.30
Lake Hill	2.98	3.05	4.91	2.06	2.24	3.84	1.91	2.21	7.51	3.24	5.16	4.78
Kingston	3.20	2.42	6.52	2.27	2.76	3.44	2.15	1.97	4.57	2.74	5.05	1.76
West Hurley	3.35	1.98	7.35	1.61	2.80	3.36	1.81	2.59	4.99	3.04	5.88	3.29
Brown Station	3.16	1.77	7.06	1.99	2.41	3.90	2.25	2.59	5.19	2.97	5.77	5.89
West Shokan †	3.86	2.10	9.25	2.84	2.36	4.76	2.51	2.85	5.25	2.96	6.30	4.26
Sena	3.44	2.12	7.24	1.16	3.44	3.49	2.01	3.64	5.54	3.18	6.44	2.68
Coldbrook	2.58	2.76	9.52	2.34	2.39	4.14	2.12	2.46	6.03	3.10	6.26	4.01
Big Indian	3.00	2.59	6.81	3.41	1.21	2.97	2.51	2.23	4.84	3.15	4.97	4.72
RONDOUT CREEK												
Grahamsville	4.06	2.74	8.16	3.51	1.92	4.40	2.73	2.39	4.43	2.94	4.14	2.86
Sundown	3.00	3.18	7.86	3.62	1.88	5.32	2.73	2.78	4.83	3.68	4.94	3.68
Peekamoose	4.08	2.90	10.07	3.54	1.92	5.84	3.42	2.21	5.75	3.59	6.42	4.98
Lackawack	2.52	2.01	6.63	2.50	1.65	3.33	2.28	2.16	5.40	3.59	4.93	3.56
Rosendale	1.70	2.06	6.26	2.06	2.85	3.75	2.37	*	......	......	......	......
SCHOHARIE CREEK												
Windham	3.33	2.63	5.46	2.82	0.97	1.86	1.36	1.21	3.06	2.66	4.54	3.40
Elka Park	4.15	3.04	10.26	3.14	2.92	5.85	2.72	2.68	7.70	4.20	7.75	7.02
Lexington	2.60	1.54	6.17	2.20	0.82	2.11	1.66	1.12	3.97	3.03	4.46	4.48
Prattsville	1.42	2.27	5.19	2.59	0.72	2.44	2.28	1.32	3.32	2.76	4.53	4.07
Grand Gorge	1.80	2.69	4.88	2.76	0.92	2.00	1.94	1.36	2.82	2.78	3.84	4.09
Stamford	2.68	3.11	5.46	3.40	1.10	2.10	2.09	1.44	4.02	3.07	3.96	3.63
Manorkill	3.32	2.96	4.40	2.13	1.47	1.86	2.26	1.32	3.64	2.66	3.94	4.94
Esperance	2.21	3.80	4.86	1.52	1.02	2.08	1.42	1.28	3.40	1.56	3.51	2.44
Gilboa	1.70	3.47	5.02	2.19	0.72	1.78	1.40	1.30	3.09	2.72	3.84	3.22
CATSKILL CREEK												
Preston Hollow	2.97	3.29	5.38	2.05	1.32	2.02	1.40	1.02	2.92	1.92	4.09	3.51
Oak Hill	2.85	2.50	4.85	1.64	0.89	2.34	1.66	1.24	3.30	2.50	4.64	3.70
Westerlo	1.22	2.77	5.10	2.11	1.10	1.50	1.34	1.27	2.36	3.28	5.76	4.57

* Discontinued January 31.
† Gage relocated at West Shokan, April 13, 1918.

Mean monthly rainfall, in inches, on CATSKILL WATERSHEDS

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total for year
ESOPUS CREEK — ABOVE OLIVE BRIDGE DAM													
1906	2.85	2.26	4.80	3.85	5.01	6.16	4.42	3.76	3.18	5.47	2.26	4.08	48.10
1907	2.59	1.66	1.20	2.17	3.83	3.45	3.13	1.17	11.49	6.78	7.06	5.80	50.33
1908	3.49	6.40	2.93	2.98	9.23	2.29	6.32	2.04	2.46	4.21	0.57	2.58	45.50
1909	4.82	6.97	4.35	5.20	4.48	4.38	2.06	4.83	4.17	1.40	1.98	4.63	49.27
1910	7.61	4.37	0.93	10.18	2.95	4.59	2.02	3.93	5.21	1.02	3.70	2.30	48.81
1911	2.60	1.94	3.90	2.37	1.06	5.94	3.19	4.83	4.25	7.50	3.50	2.91	43.99
1912	2.38	2.96	5.96	5.76	4.36	1.72	3.25	7.47	3.44	4.84	4.08	4.70	50.92
1913	4.26	2.28	7.70	3.81	3.74	1.01	1.90	4.86	4.02	6.76	5.60	2.93	48.87
1914	3.40	2.44	4.02	5.94	2.99	3.18	3.49	3.91	0.56	2.97	3.32	3.69	39.91
1915	6.85	5.32	0.21	2.16	2.27	2.96	8.59	8.93	2.99	2.48	3.90	5.86	52.52
1916	1.64	4.48	3.23	2.63	3.35	5.33	8.14	1.96	4.23	3.15	4.37	2.98	45.49
1917	4.14	2.15	3.53	2.47	4.27	6.72	4.04	6.58	1.09	7.70	1.08	2.45	46.22
1918	3.49	2.65	2.75	4.22	4.62	3.29	3.35	2.33	7.90	2.59	2.20	3.52	42.91
Mean	3.86	3.53	3.50	4.13	4.01	3.92	4.15	4.35	4.23	4.37	3.36	3.73	47.14
RONDOUT CREEK — ABOVE HONK FALLS AND LACKAWACK													
1906	2.69	2.64	3.91	4.54	4.34	5.23	5.51	4.47	3.87	4.40	2.15	4.20	47.95
1907	3.43	1.93	1.93	2.19	3.68	3.69	2.95	1.88	9.42	5.50	6.32	5.03	47.95
1908	3.12	6.24	3.53	4.02	7.64	1.75	5.08	2.59	2.64	3.74	0.72	3.09	44.16
1909	4.82	6.61	3.99	4.71	3.36	4.39	2.07	4.46	3.54	1.25	1.86	4.47	45.53
1910	7.07	4.53	1.03	8.30	3.60	4.22	2.34	4.08	5.25	1.18	3.36	2.25	47.21
1911	3.44	1.99	4.42	3.11	1.16	6.57	3.27	5.14	4.17	7.10	3.43	3.08	46.88
1912	2.24	2.41	5.86	5.77	3.59	1.91	2.82	7.32	3.79	3.92	3.02	4.78	47.43
1913	5.05	2.61	7.65	4.67	3.46	1.44	3.38	6.04	4.20	6.53	4.74	2.72	52.49
1914	3.33	2.13	3.57	4.91	2.98	4.28	4.06	4.14	0.71	2.64	2.74	3.82	39.31
1915	6.63	5.41	0.33	2.33	3.00	3.45	9.83	7.17	3.03	2.57	3.40	6.11	53.26
1916	2.35	4.87	3.84	3.64	3.71	5.76	9.08	2.19	5.31	3.25	3.95	3.61	51.56
1917	4.04	2.76	3.92	2.15	3.32	6.76	5.51	8.05	1.31	7.10	1.48	2.25	48.65
1918	3.76	3.79	2.72	4.39	3.26	3.71	3.40	2.71	8.18	3.29	1.84	4.72	45.77
Mean	4.00	3.69	3.59	4.21	3.62	4.09	4.56	4.63	4.26	4.04	3.00	3.86	47.55
SCHOHARIE CREEK — ABOVE PRATTSVILLE													
1907	2.05	1.54	1.04	2.33	3.46	3.27	3.28	0.76	8.29	5.51	6.08	4.66	42.27
1908	2.93	5.51	2.31	2.68	7.53	2.22	4.36	2.32	2.82	4.31	0.44	2.01	39.44
1909	4.12	4.82	3.38	4.47	4.24	4.19	1.53	3.23	3.17	1.35	1.85	4.14	40.49
1910	6.67	3.42	0.62	7.76	3.07	5.03	1.54	2.23	4.22	0.80	4.94	1.45	41.75
1911	1.85	1.13	2.13	1.43	1.43	6.09	2.06	4.16	3.21	4.68	1.99	1.79	31.95
1912	1.66	2.14	4.06	4.88	3.61	1.52	2.60	3.84	3.48	3.31	3.14	2.86	37.13
1913	2.78	2.00	5.24	3.22	3.05	1.58	1.46	3.56	3.16	5.34	5.59	1.94	38.92
1914	2.28	2.28	4.50	5.22	3.27	2.96	4.22	4.71	0.87	1.93	2.72	2.62	37.58
1915	4.18	4.09	0.22	2.21	2.19	2.34	8.01	7.50	3.77	2.32	2.53	5.54	44.90
1916	1.06	4.31	2.81	2.66	2.82	4.02	6.44	4.72	4.22	2.11	3.13	2.12	40.42
1917	3.11	1.30	2.62	1.71	4.04	5.63	2.61	6.03	1.15	8.25	0.88	2.28	39.61
1918	3.19	2.03	2.55	4.34	5.02	3.14	2.88	2.37	6.76	2.56	1.36	3.05	39.25
Mean	2.99	2.88	2.62	3.58	3.65	3.50	3.42	3.79	3.76	3.54	2.89	2.87	39.48

Note for Esopus creek.— January, 1906, to November, 1906, inclusive, average of 6 stations. December, 1906, average of 7 stations. January, 1907, to June, 1907, inclusive, average of 8 stations. July, 1907, and August, 1907, average of 11 stations. September, 1907, to December, 1909, inclusive, average of 12 stations. January, 1910, average of 11 stations. February, 1910, and March, 1910, average of 12 stations. April, 1910, to January, 1915, inclusive, average of 10 stations. February, 1915, and March, 1915, average of 11 stations. April, 1915, average of 10 stations. May, 1915, to October, 1915, inclusive, average of 11 stations. November, 1915, and December, 1915, average of 12 stations. January, 1916, to March, 1916, inclusive, average of 13 stations. April, 1916, average of 12 stations. May, 1916, to November, 1916, inclusive, average of 13 stations. December, 1916, to February, 1917, inclusive, average of 12 stations. March, 1917, to December, 1917, inclusive, average of 11 stations. January, 1918, and February, 1918, average of 9 stations. March, 1918, and April, 1918, average of 10 stations. May, 1918, to December, 1918, inclusive, average of 11 stations.

Note for Rondout creek.— January, 1906, to December, 1906, inclusive, average of 4 stations. January, 1907, to March, 1910, inclusive, average of 6 stations. April, 1910, to December, 1917, inclusive, average of 5 stations. January, 1918, to December, 1918, inclusive, average of 4 stations.

Note for Schoharie creek.— January, 1907, to June, 1907, inclusive, average of 6 stations. July, 1907, to December, 1907, inclusive, average of 7 stations. January, 1908, to March, 1910, inclusive, average of 5 stations. April, 1910, to April, 1917, inclusive, average of 4 stations. May and June, 1917, average of 5 stations. July and August, 1917, average of 6 stations. September and October, 1917, average of 7 stations. November and December, 1917, average of 8 stations. January, 1918, to December, 1918, inclusive, average of 4 stations.

Mean monthly rainfall, in inches, on CATSKILL WATERSHEDS—*Continued*

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total for year
CATSKILL CREEK — ABOVE OAK HILL													
1907	1.92	1.28	1.16	2.38	3.25	3.15	3.31	0.85	6.58	4.18	4.91	3.52	36.49
1908	2.43	4.01	1.83	2.15	5.86	1.58	4.00	3.01	1.59	3.35	0.39	1.57	31.77
1909	3.56	3.76	2.79	3.00	3.92	3.52	2.36	2.47	2.74	0.96	1.50	3.59	34.17
1910	4.67	3.02	0.48	5.70	2.94	4.82	1.21	1.55	4.07	0.91	3.57	0.92	33.86
1911	1.32	1.13	2.07	1.55	1.41	7.06	2.20	3.38	2.94	4.32	1.45	1.87	30.70
1912	1.71	2.12	3.50	4.50	3.36	1.08	2.63	3.80	3.27	3.86	2.78	2.37	34.98
1913	2.66	1.87	4.60	3.05	3.18	2.16	1.83	1.37	2.67	4.89	4.73	1.83	34.84
1914	2.10	2.14	4.78	5.32	3.26	2.50	3.97	4.18	0.64	1.53	2.49	2.43	35.34
1915	3.40	3.31	0.09	2.03	1.91	2.60	6.93	7.20	2.78	2.22	2.60	5.66	40.73
1916	1.09	4.01	3.28	3.56	2.88	3.22	4.42	3.70	3.67	1.82	2.76	2.11	36.52
1917	1.76	1.46	2.49	2.07	4.12	4.01	1.49	5.65	1.08	7.38	0.81	2.22	34.54
1918	2.57	1.14	2.42	3.75	4.02	2.39	2.74	2.83	5.03	2.05	1.15	1.91	32.00
Mean	2.43	2.44	2.46	3.26	3.34	3.17	3.09	3.33	3.09	3.12	2.43	2.50	34.66

Note for Catskill creek.— January, 1907, to December, 1907, inclusive, average of 6 stations. January, 1908, to August, 1917, inclusive, average of 5 stations. September, 1917, to December, 1917, inclusive, average of 6 stations. January, 1918, to December, 1918, inclusive, average of 5 stations.

WATER SHEDS AT LARGE

Stations maintained by the Board of Water Supply of New York city.

Monthly rainfall, in inches, on various watersheds, for the year ended June 30, 1919

STATION	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
PEEKSKILL CREEK												
Peekskill	4.98	2.61	4.55	1.20	2.57	3.70	.....	.....	.....	.....	.....	.....
Nelsonville	4.18	2.38	5.81	1.96	2.55	4.33	.....	.....	.....	.....	.....	.....
WALLKILL RIVER												
Wallkill Blow-off	3.04	2.10	5.91	1.77	2.98	4.00	2.50	2.40	4.81	3.71	5.96	2.89
Sherwood Corner*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Discontinued.

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